ILLUSTRATED
ELECTRICAL REVIEW
A Journal of Scientific and Electrical Progress.

VOL. 28. No. 23. WEEKLY. | NEW YORK, WEDNESDAY, JUNE 3, 1896. | $3 PER ANNUM. Single Copies, 10 Cents.

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VIEWS, NEWS AND INTERVIEWS.

There are always a quantity of telegraph stories going about, says the London *Electrical Engineer*. The following one is represented as having been told by Sir Robert Low as an example of the difficulties he had with the field telegraph in the Chitral campaign. The native chiefs were at first rather suspicious of the wire, as they thought it was a mark for parcelling out the country among the soldiers, but, on being told that it was to send messages to India, they agreed to guard it. As, however, they did not see any messages passing along, they cut off a couple of miles of wire and took it away to watch the messages more at their ease. Their investigations were interrupted by the return of the engineers to see what had happened to the wire and why communications were cut.

A pretty illuminating, as well as ornamental, effect at the Casino, Central Park, New York, has been obtained by bordering the outlines of the flower beds with a fringe of electric lights of various colors.

A Russian medical man, Dr. Kotz, has noticed, says a foreign exchange, that when a light fatigues the eye, the eye seeks repose in a wink, and that the more tiresome the light is the more frequent is the winking. Therefore he set to to compare the tiresomeness of different lights by counting the winks; and he found that with a candle the eye winked 6.8 times a minute, with town gas 2.8 times, with daylight 2.2 times, and with electric light 1.8 times a minute. Why not a nod? A nod is as good as a wink.

Mr. Philip Diehl, the electrician of the Diehl Manufacturing Company, of Elizabethport, N. J., is an enthusiastic investigator of the X ray and has accomplished some very interesting results in radiography. Mr. Diehl was one of the earliest investigators of this interesting subject, and has a well equipped laboratory in which to carry on his experiments.

Dr. Cornelius Herz.

The demand for the extradition of Dr. Cornelius Herz has been refused by Sir John Bridge, who sat specially in the Extradition Court, London, for the purpose. Sir John said:

In my opinion this prosecution must be discharged. I never give long reasons in a matter of this kind, but I do so on the ground that no jury could possibly be expected to convict. You have got, first of all, to say that this letter, written in 1889 in acknowledgment of money due, meant something entirely different from what is said. But, up to the present time, no one has ever said that this letter does not truly represent what were the true relations of parties. If so, it is clear that at that time there would be money payable to Herz from Reinach on August 1, 1891. If the money was payable on that date, it would seem to me that you would answer the supposed threats contained in these telegrams. No jury would say that in this case this was a menace, and, further, no jury would say that there was not money due. A man has a right to use a certain amount of threats—I will not say how much—to get the money due to him.

The London *Times* says editorially that the decision is received with general satisfaction. Dr. Herz is still quite ill at Bournemouth. He was at one time publisher of *La Lumiere Electrique*, and a well known electrical man.

ELECTRIC LIGHT POINTERS.

There is a point in connection with the use of transformers which is too often overlooked, and that not only by the ordinary lineman, but also by those who should, and frequently do, know better; that is, the size of the secondary conductors, not with regard to their carrying capacity as to *heat*, but as to *fall of potential*, or drop. The man accustomed to arc-light practice almost invariably uses No. 6 B. & S. wire and nothing else, and very often he never thinks at all about the wiring from the converter to the lamps, or possibly takes the size of the wire from the heating limit prescribed at divers times by some fire underwriters' association.

Fig. 1.—C. & C. Electric Company's Multipolar Dynamo.
(See page 290.)

Quite recently the "outside man" of a local lighting company put up a 150-light transformer to supply two or three buildings, and employed a feeder of No. 0 wire to carry 150 amperes at 50 volts some 200 to 250 feet, when the required size for two per cent would be about about four 0000 wires. In some underwriter's table he had found the "carrying capacity" of No. 0 to be 190 amperes, and was much surprised when his lamp voltage only came up to 45 or 46 volts.

Here is an old but simple formula, which can be used by any one who understands the ordinary rules of arithmetic:

$$\frac{C \times D \times 22}{\text{Volts lost.}} = \text{Circular mils.}$$

In other words, the current in amperes multiplied by the distance in feet (one way, not total length of circuit) and by the constant 22, and divided by the number of volts allowable loss (actual number, not per cent), gives the "circular mils" of the required wire, and to find the gauge number of this it is only necessary to refer to the tables of wire furnished by manufacturers and dealers.

It should be remembered that for 50-volt circuits the current may be taken at one ampere per lamp, and for 100 volts or 110 volts half an ampere is near enough for ordinary purposes. Remember, two per cent is one volt on 50-volt circuits, and that dividing by one is not dividing, and also that one per cent is half a volt, and dividing by one-half is multiplying by two. This should not need to be mentioned, but a deservedly respected firm of engineers not long ago made this very mistake, and gave the size of a conductor as just one-fourth what it should have been. This, of course, was a "herror of hoversight, not a herror of hignorance."

J. E. T.

The annual meeting of the Calumet Electric Street Railway Company was held recently in Chicago. The former officers were re-elected as follows: President, John Farson; secretary and treasurer, H. B. White; general manager, H. M. Sloan. The report of the general manager showing, practically, the completion of the extensions, to a connection with the Alley Elevated at Sixty-third street and South Park avenue, the Seventy-third street and Railroad avenue franchise extensions to Manhattan and Cheltenham beaches, and the Avenue N line in South Chicago, extending to Roby and Hammond, Ind., was submitted and approved. This gives the road about 80 miles of track. By resolution, the capital stock was increased to $5,000,000.

THE CLOSE OF THE EXPOSITION.

After Four Weeks of Successful Work the Electrical Show Comes to an End.

THE ATTENDANCE NUMBERS OVER 150,000—WELL-PLEASED EXHIBITORS AND VISITORS—THE PROFITS OF THE EXPOSITION—TALK OF ANOTHER SIMILAR EXPOSITION—THE BANQUET AT THE WIND-UP—PRESIDENT H. J. SMITH AND HIS ASSOCIATES VERY HAPPY OVER THE RESULTS.

The Electrical Exposition closed its doors Saturday, May 30, at midnight. Its last week was its best week. There was larger attendance and more evidence of interest in exhibits and lectures. The total number of persons who have visited the Grand Central Palace during the four weeks of the electrical show exceeds 150,000. As far as the ELECTRICAL REVIEW can learn, every exhibitor is well pleased with the result. The benefits of such an exhibition in acquainting the general public with the work electricity is doing every day in the various industrial branches will be lasting and important. A vast amount of electrical literature has been distributed, carrying information into families throughout the eastern country. Many visitors came from distant cities and States, and all found something to interest and instruct.

The Edison X-ray exhibit was undoubtedly the most potent attraction, and on the last day was shown to thousands in the afternoon as well as in the evening. Already showmen who witnessed the public interest are arranging to give similar exhibits throughout the country.

Mr. H. J. Smith, president of the Exposition Company, and his associates are, naturally, greatly pleased over the successful outcome of the Exposition. There were many difficulties encountered and overcome, and the gentlemen who labored so persistently and earnestly are being rewarded by congratulations from all sides. The profit to the stockholders, after paying the proper share to the National Electric Light Association, under whose auspices the Exposition was held, is between $15,000 and $20,000, and we are sure that no one will begrudge the enterprising and courageous gentlemen in the electrical and allied fields who so earnestly labored for the symmetrical success of the Exposition the fair return they will receive for the means, time and labor expended.

A very excellent conclusion of the Exposition took the form of a dinner given by the exhibitors to the Exposition officials. It occurred at the Murray Hill Hotel after the close of the Exposition, Saturday night. Addresses of a complimentary and grateful nature were numerous, Col. W. S. Rogers, of the Brush Electric Company, presiding. Mr. Edison and other electrical gentlemen were toasted for the aid they had given the enterprise, and the probability of future electrical expositions was favorably commented on. Among the speakers were President H. J. Smith, Arthur Williams, J. W. Godfrey, T. C. Martin, Elmer P. Morris, C. O. Baker, Jr., John A. Seely, J. W. Lieb, J. W. McKinney, and Hugh Harrison.

SPECIAL CONVENTION NOTES.

The Clonbrock Steam Boiler Company received their World's Fair diploma in time to have it neatly framed and exhibited at the Exposition the last two days. It was an object of attraction for all the boiler and power men generally, and the Clonbrock people were congratulated on getting it in the nick of time and so promptly presenting it. No other World's Fair diploma was in evidence at the Exposition.

The Exposition may be said to have begun and closed in a blaze of light as well as glory. Some very tired electrical men will now rest for a few days and nights.

Mr. John Jacob Astor, bronzed from his recent ocean trip, was an interested visitor to the Exposition, Saturday night, and enjoyed a special view of the Edison X-ray exhibit.

The De Wolf Hopper Opera Company were visitors to the Exposition late Saturday night and had a private view of the X rays, phosphorescent diamond, etc. Mr. Hopper and J. W. McKinney, manager of the company, were present with the entire company.

Prof. John B. De Motte, of the Redpath Lyceum Bureau, was an Exposition visitor last week and a caller at the headquarters of the ELECTRICAL REVIEW.

Mr. B. E. Greene, as the press agent for the Exposition, has performed a difficult task with much diplomacy, tact and success. The daily papers of New York city devoted hundreds of columns to the show, and it was to Mr. Greene that the reporters turned for the facts on which to base their stories.

Three of the hardest working members of the Exposition Company were Messrs. Weiss, Corey and Lufkin. These gentlemen were at the show early and late. Their presence was evidenced in many unlooked-for emergencies requiring tact and skill.

The work of taking away the exhibits must be concluded this week. Secretary Porter and Superintendent Nathan will remain at the Grand Central Palace during this period, assisting in the removal.

A complete motor and truck of the standard Peckham type was exhibited by the Peckham Truck and Motor Company, of New York.

The pretty booth occupied by the Bernstein Electric Company, of Boston, was tastefully arranged to show the excellent incandescent lamps made by them.

The New York & Ohio Company's exhibit of incandescent lamps and Crookes tubes was in the hands of this company's New York agent, Stanley & Patterson.

In the machinery department the booth of Bourne, Scrymser & Company was prominent, showing a large line of lubricating oils.

The Heine Boiler Company, St. Louis, were showing a model of a 250-horse-power boiler.

Mr. Chas. D. Doubleday, representing the American Circular Loom Company, of Boston, since the Exposition, has had headquarters at the Murray Hill Hotel and also a line of the products on exhibition in the Exposition.

The engine shown by the Watertown Engine Company, of Watertown, N. Y., has attracted much attention as being so compact and perfect in construction.

The Holtzer-Cabot Electric Company, Boston, had a very elaborate display of general supplies and a variety of types of the fan motor.

The J. H. McEwen Manufacturing Company had one of their dynamos in operation in the power hall.

The R. D. Nuttall Company, Allegheny, Pa., were showing at the Exposition a full line of their electric railway equipments and specialties.

The Electric Appliance Company, of Chicago, have brought out two more very clever and original advertising schemes in the shape of a pad or tablet of blank forms on which can be recorded 30-minute readings of the number of amperes as shown by the station ammeter. This gives a permanent record of the station load at 30-minute intervals during the entire 24 hours. Their other scheme is a complete set of architect's specifications for electric wiring, which can be used as a form for making contracts for electric wiring. These specifications have been carefully drawn by a well known consulting electrical engineer and will be found valuable guides in all electric light work. The Electric Appliance Company are prepared to furnish either or both of these free on application.

EXHIBIT OF THE OKONITE COMPANY AT THE ELECTRICAL EXPOSITION.

FRONT VIEW OF THE EXHIBIT OF THE ABENDROTH & ROOT MANUFACTURING COMPANY AT THE ELECTRICAL EXPOSITION.

TELEPHONE NEWS AND COMMENT.

The Chesapeake & Potomac Telephone Company will inaugurate a limited-service system on July 1.

The Central District and Printing Telegraph Company is considering the adoption of a limited-service telephone system.

The Iowa Union Telephone Company has recently completed connections with Rock Valley, Hull and Centerville, Iowa.

It is reported that the project to form a combination of the independent telephone companies of Western Pennsylvania is gaining strength.

A company has been organized for the purpose of extending a telephone line from Tunkhannock to Centremoreland, Pa., and material has already been procured for its construction.

A new independent exchange has recently been completed at Murfreesboro, Tenn., and the Cumberland Telephone and Telegraph Company has reduced its rates to 50 cents a month for residence telephones.

The management of the Richmond, Va., Telephone Company is reported to have stated positively that their exchange would be in operation by June 6, the date when the limit allowed by their franchise expires.

At a recent meeting of the directors of the Home Telephone Company, of Mobile, Ala., the following officers were elected for the ensuing year: A. S. Lyons, president; James K. Glennon, vice-president; Adam Glass, treasurer; W. H. Fitzpatrick, secretary.

The chances are at present that the new building of the New England Telephone and Telegraph Company, at Worcester, Mass., will be occupied by the corporation Monday morning, June 22. But it is barely possible that the removal from the old to the new office may be effected on Monday, June 15.

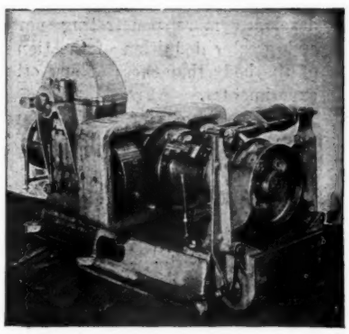
The output of the American Bell Telephone Company for the month ended May 20 was as follows:

	1896	1895
Gross output,	20,001	18,149
Returned,	7,537	6,958
Net output,	12,464	11,191
Since December 20:		
Gross output,	96,519	68,306
Returned,	35,999	32,183
Net output,	60,520	36,123
Total outstanding,	737,856	618,629

The Metropolitan Telephone and Telegraph Company, of New York city, recently installed in the Hotel Bartholdi, as an experiment, a telephone pay-station to be kept open all night. It was the only one in the city. As the public demand for such a convenience was not satisfactory financially, the station will hereafter be closed at midnight.

D. B. Sperry and Attorney C. R. Sperry, representing the Fulton Chain Telephone and Telegraph Company, have perfected the transfer of the Lowville & Watson, N. Y., Telephone and Telegraph Company to the Fulton Chain Telephone and Telegraph Company. The line is now in operation from Lowville to Beaver River station by the way of Petries Corners and Chases Lake.

The formal articles of incorporation of the Home Telephone Company, of Syracuse, N. Y., have been filed with the County Clerk. The papers say that the company is organized for the purpose of owning, constructing and maintaining electric telegraph and telephone lines in the county of Onondaga. It has a capital stock of $200,000, and consists of 20,000 shares with a par value of $10 each. The following are the directors: R. S. Law, New York; John Gibney, Sing Sing; Edgar L. Ryde, Sing Sing, and L. E. Wilmarth, E. A. Andrews, John Filmer and Robert Baker, of Brooklyn. Of the capital stock, but $12,500 has been issued, Robert Baker subscribing for $12,400 and 10 other incorporators subscribing $10 each.



AUTOMATIC HOUSE ELEVATOR EXHIBITED BY THE SPRAGUE ELECTRIC ELEVATOR COMPANY, OF NEW YORK, AT THE NATIONAL ELECTRICAL EXPOSITION, NEW YORK CITY.

The mile of road installed by the New York, New Haven & Hartford Railroad, at Nantasket Beach, Mass., on the third-rail system, is reported to have been successfully tested. It is said that this system will replace the overhead wires on that branch of the road.

The Cincinnati Street Railway Company has issued positive orders to its motormen not to drop fenders for dogs. Superintendent Smith, of the Humane Society, has said, concerning this new mandate of the railway company, that, if a specific charge is brought against a motorman for refusing to drop his fender to save the life of a dog, the society will take action in the case.

Electricity in a Restaurant.

In Thirty-first street, near Broadway, New York city, is a restaurant well known to the electrical men of the metropolis, where electricity is probably used for more purposes than in any other similar establishment. It is called "The Arena," and its proprietor, Mr. Wm. C. Muschenheim, is a great believer in the electric current. The electric lighting of the buildings is carried out in a lavish but correctly designed manner, and the electric ventilating system, one of Mr. Muschenheim's own ideas, is a perfect success. Lundell ventilating fans and "white wings" ceiling fans perform this work. The meat-choppers, ice-crushers and ice-cream freezers are all run by Lundell stationary motors.

PERSONAL.

Mr. William J. Francioli, private secretary to the late Col. F. K. Hain, has been appointed general manager *pro tem.* of the Manhattan Railway Company, of New York city.

Mr. Samuel Bryan, of Washington, D. C., president of the Chesapeake & Potomac Telephone Company, came over to New York last week and spent a few hours with his Metropolitan friends.

Mr. H. C. Cushing, Jr., author of the very successful book entitled "Standard Wiring," has removed to New York city, and assumes the responsible duties of electrical inspector for the Fire Underwriters' Tariff Association. The ELECTRICAL REVIEW congratulates Mr. Cushing on his deserved advancement and believes the electrical interests of New York will be benefited by his presence.

President Parks Fostor, of the Toledo, Bowling Green & Fremont, Ohio, Electric Railroad Company, has resigned the presidency of that company in order to give necessary attention to another road in which he is interested. He will still retain a place on the board of directors of the Toledo, Bowling Green & Fremont road. S. C. Schenck, who is vice-president of the company, will fill the vacancy temporarily.

B. S. Tolan has been appointed architect for a new $500,000 court house for Allen County, to be built in Fort Wayne, Ind. An electric lighting plant will probably be required.

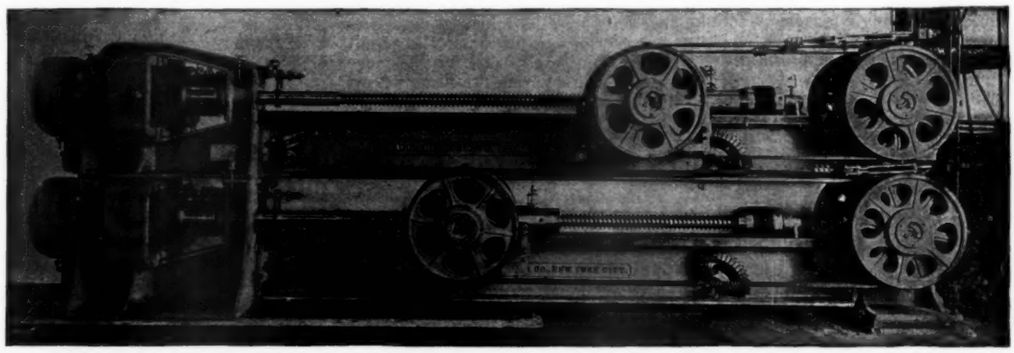
An Intelligent Review of the Electrical Exposition.

In the New York *Evening Post* of May 30 appeared an interesting and accurate account of the Electrical Exposition. We present it in part to our readers, not only for the information it contains, but as showing the intelligence which some of the daily papers are now devoting to electrical work:

An *Evening Post* reporter is informed that when the members of the National Electric Light Association organized their little company to take care of the show, they stipulated that the association should receive $2,000 for the use of its name, and a certain percentage of any profits that might accrue, so that the art as a whole might benefit directly. Even so late, however, as the beginning of the show, when the association held its convention, it was resolved by the officers of the association that, in view of the obvious good that would result to the business of electric light and power, and the great likelihood of a failure, the Exposition company should not be pressed for the full amount of $2,000. This inside fact is an indication of the fear and apprehension with which the enterprise was approached; but the first three days swept away every apprehension, and it is pleasant to record the fact that the Exposition has been a financial success, not making a large amount of money, but enough to recoup the enterprising and public-spirited men who set it on foot, and to return a substantial sum to the treasurer of the association, who will use it at once for work in the collection of data and the diffusion of information needed by its members.

From first to last, the exhibition has received the support of all the electrical bodies, technical and industrial, and the attendance of electricians and engineers has been remarkably large. It is, however, stated that the American Street Railway Association, although it indorsed the enterprise before any other body had done so, has not lent any active co-operation, and the reason assigned for this is the fear that the expense of taking part in the show might deter many people from exhibiting at the annual convention of the Street Railway Association at St. Louis next Fall.

It is also singular that, while such concerns as the General Electric and Westinghouse companies have been equipping standard railroads with heavy locomotives, they made not the slightest effort by model or technical picture to show to the public what they had done or what they were aiming at. The Exposition company has, however, taken this deficiency in a complacent way, as not due to any lack of striving on its part.



DOUBLE-DECK MULTIPLE SHEAVE SCREW ELECTRIC ELEVATOR MACHINE. THE SINGLE SHEAVE WAS EXHIBITED AT THE NATIONAL ELECTRICAL EXPOSITION, NEW YORK CITY, BY THE SPRAGUE ELECTRIC ELEVATOR COMPANY, NEW YORK.

SINGLE-PHASE, SELF-STARTING SYNCHRONOUS MOTORS.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, NEW YORK, MAY 6, 1896, BY F. H. K. LEONARD, JR.

(Concluded from page 279.)

An arrangement for elevator service which is extremely simple has been devised. The constant-speed alternating motor, cable drum and gearing are all mounted on a single-base casting, in which the respective parts are bolted. There is a pinion on the shaft of the motor which engages two bevel gears, each mounted on a sleeve, which also carries one part of a friction clutch, the two sleeves rotating in opposite directions, and the whole being supported by and turning freely on the worm shaft which engages the worm wheel that turns the cable drum. The other part of each clutch is keyed to the worm shaft. The controller wheel is mounted on an extension which is cast on the case that entirely incloses the bevel gears and pinion, permitting them to run constantly in oil. This controller wheel is connected to the controller cables or hand ropes which serve to operate the elevator. A pull on the hand rope turns the controller wheel, rotating it through an arc of 60 degrees. This rotation serves, first, to release the brake on the worm shaft, by means of the adjustable link and lever, by depressing the roller which travels over the cam in the controller wheel; at the same time one shipper-fork is moved by the connecting rod at its upper end, which is pivoted near the upper rim of the controller wheel, far enough to cause one of the clutches to engage its other part on the sleeve attachment to the bevel gear, so as to drive the worm shaft and rotate the cable drum. At the same time the connecting-rod attachment to the shipper-fork opposite moves across the center of the controller wheel without producing more than enough movement to take up the lost motion in the clutch parts to which it is attached. Pulling the hand rope in the opposite direction brings the parts back to their original position, disengages the clutch, and sets the brake on the worm shaft. Pulling still further in this direction, the opposite connecting rod travels so as to move the shipper-fork and engages its clutch, turning the hoisting drum in the opposite direction, while the first-mentioned connecting rod moves across the center without causing any appreciable movement of the shipper-fork.

The motor runs continuously in one direction during working hours, and there is no heavy rush of current in starting, as with a direct-current series motor, with its tendency to drop the brilliancy of the incandescent light on the same circuit. Neither is there any necessity for complicated automatic starting rheostats, safety devices and multiplicity of connections. Two wires only connect the secondary of the transformer which furnishes the alternating current to the motor. There are many classes of work in connection with which perfect uniformity of speed is of vital importance. To such cases these motors are peculiarly adapted, as an overload of 50 per cent may be instantly thrown on to these motors and the next instant thrown off without changing the speed in the least; not even causing a variation of a fraction of a revolution.

These motors are suited to any frequency in general use in this country, and are wound for from 140 to 60 complete periods per second, the speed being fixed by the frequency of the generator or circuit to which it is connected. It will no doubt be understood, however, that a motor wound from 140 periods, or 16,800 alternations, under which conditions it would run at 1,400 revolutions per minute, would not be suited for use on a 60-period circuit, or 7,200 alternations, where the motor would run at 600 revolutions per minute.

All sizes from one horse-power to and including the 10 horse-power are wound for 100 to 110 volts secondaries, though the larger sizes are designed for higher potentials, as 200 and 300 volts, and even for direct connection to primaries where proper attendants are in charge, though this would not be safe in general practice where the person dealing with the motor is not fully acquainted with what he is handling.

While this motor was designed for single-phase circuits, yet it is obvious that it will work quite as satisfactorily when connected to either leg of a two or three-phase circuit, and, where such circuits are loaded with induction motors, a few synchronous motors, properly distributed and somewhat over-excited, would serve to allay the pernicious effects of the inherent lag or idle current which goes with induction motors, at the same time raising the electro-motive force at the extremities of the line, reducing the drop in the inductors and allowing the generators to do more work, inasmuch they would not be required to deliver so large a wattless current.

This synchronous motor is also a good rotary transformer, and lends itself very conveniently for charging storage batteries and electrolytic work, the alternating current entering at collector rings, while direct currents are delivered from the commutator brushes. For laboratory work and as a piece of apparatus in colleges that teach electric engineering it is invaluable; for, besides the previously mentioned uses, it may be driven by direct currents as a series motor; further, it may be run at a constant speed as a direct-current shunt motor, while from the collector rings alternating currents may be taken at any frequency, dependent upon the speed, which can be regulated by resistance in the field or armature circuits; or, belt driven, it may be used as a self-inciting alternator.

OUR CANADIAN LETTER.

STERLING, ONT.—Sterling will soon be lighted by electricity.

SANANOQUE, ONT.—The electric light company at Sananoque, Ont., will put in two new dynamos.

KASLO, B. C.—Kaslo is determined to have a waterworks system, and is also negotiating for an electric light plant.

MAGOG, QUE.—Magog is prepared to receive tenders for lighting the town by electricity. Water power can be had from the Dominion Cotton Mills Company here.

BEETON, ONT.—Beeton is to have electric light at once, if enough subscribers can be had. Mr. Fletcher, of Alliston, Ont., will put in the plant and J. L. Hamilton will supply power.

NIAGARA FALLS, ONT. — The Niagara Falls, Ont., Electric Light and Power Company, of Niagara Falls, have awarded the contract for a 5,000-light incandescent plant to the Canadian General Electric Company, Limited. J. A. C.

Montreal, May 20.

Tesla and Edison Apparatus.

TO THE EDITOR OF ELECTRICAL REVIEW:

You deserve the hearty thanks of all who are interested in the progress of the Roentgen-ray researches for the many excellent articles which have appeared in your journal upon the subject, but especially for those emanating from Mr. Tesla. Nothing has been done which promises more for the aid of medicine and surgery than these experiments of Mr. Tesla, for his appliances appear to have developed more penetrating power and greater definition of the tissues of the body than those of any other experimenter.

You would confer a great favor upon those who are attempting to follow in the wake of these able investigators, if you would take pains to present in your columns a detailed description of the apparatus that is employed by them. It would be very interesting to a large number of your readers, I am sure, if you would have a competent member of your staff describe in detail the apparatus employed both by Mr. Edison and Mr. Tesla. The structure of the coils they make use of, the manner of getting the interruptions in the circuit, the frequency of interruptions and the electro-motive force employed; also the source of, amount and electro-motive force of the current used to excite the primary coil. These are bits of information which all persons need who are attempting to secure equally good results with those that have been reported from the laboratories of these two able investigators. Would it be presumption on my part to ask you to furnish this information through the columns of your journal?

Very truly yours,

W. J. HERDMAN.

University of Michigan, Ann Arbor, May 26.

LITERARY.

McClure's Magazine for June contains a little battle study by Stephen Crane that, in its way, is more dramatic and striking than even "The Red Badge of Courage," the novel by Mr. Crane which is now attracting so much attention both in America and England.

Among the many valuable recent publications of the Vienna firm, A. Hartleben, whose name is known all over the world as the publisher of standard electrical books, there is one to which we desire especially to direct the attention of the readers of the ELECTRICAL REVIEW. The book is entitled "Praktisches Handbuch des Electrotechnikers für Beleuchtungs und Schwachstrom Anlagen," *i. e.*, a practical vade mecum for electrical engineers engaged in electric light work and the installation of plants requiring low-voltage currents. The principal aim of the author, Mr. J. Zacharias, is to instruct persons who devote themselves to the practical work; in other words, the book is not written for students or physicists. For this reason the usual reproductions of well known apparatus have been wisely omitted, likewise the description of such electrical devices as are familiar to every practical electrician of our days. Great stress is, however, laid upon a lucid description of the various circuits, and here the author displays his skill, knowledge and practical experience. He also treats very extensively the sources of weak electric currents—voltaic batteries. We are glad to note that this chapter is not a rehash of musty and old electrical traditional lore; on the contrary, it is original, and contains very valuable up-to-date information. Again, the modern electrical counting apparatus, such as volt, watt and ampere meters, come in for a very careful and exhaustive analysis, and, as the types represented are both of European and American manufacture, this part of the book can not fail to be of interest to the practical American engineer. The book may be ordered through the ELECTRICAL REVIEW, New York. Price, four marks.

A Wave Motor Inventor Wants Help.

TO THE EDITOR OF ELECTRICAL REVIEW:

After a number of years of experiment, study and investigation of more than 100 experimental and patented devices for utilizing the enormous force of the ocean waves for the production of power for mechanical purposes, I have succeeded in taming these hitherto turbulent forces and making them work obediently in harness. Though the field is the most extensive yet available to man's ingenuity, it remains *practically* wholly undeveloped. Hundreds of ingenious inventors have attempted to solve the problem for more than 50 years, yet there is not a successful wave motor worthy of the name in operation in any country.

My apparatus is simple, effective, cheaply constructed, and, above all, *safe* against the furious storms that are the chief obstacle to permanent operation.

Edison has emphatically declared that when the ocean billows shall have been successfully harnessed, "then will come the millennium of electrically." There is more power going perpetually to waste in a square mile of ocean tossed by the winds than in all Niagara Falls. Who will assist me in demonstrating in a practical apparatus that the sea coast of any country will furnish almost costless energy to generate electrical currents sufficient for the needs of all communities within a few hundred miles of the ocean?

Full information will be furnished on application to INVENTOR,

Care ELECTRICAL REVIEW, N. Y.

Washington, D. C., May 26.

In the United States Circuit Court at Boston, on May 25, Judge Colt gave a hearing on application for injunction and accounting in the case of the Thomson-Houston Electric Company vs. Albert Anderson and others for infringement of certain patents for suspended switches and traveling contact for electric railways.

GENERAL NOTES.

The electric light plant at White Haven, Pa., was burned on May 18. Loss, $20,000.

Work is to begin soon on the Eighth avenue horse car line in New York city for equipping it with the underground trolley system.

The Chicago, Lake Street, "L" has now been fully equipped with electricity, and as soon as air brakes are fitted to cars steam will be entirely discarded.

The General Electric Railway Company, of Chicago, has won the suit brought against it by the attorney-general. It is reported that the road will now be constructed with the Love underground electric system.

The management of the Seventh Avenue Line, Brooklyn, N. Y., carries off the highest honors for inefficiency and disregard of the needs of its patrons. The Hon. Tom Johnson should look into this.

The story is again current regarding a consolidation of all of the Allegheny, Pa., street railway companies. A syndicate, formed in that city, headed by a well-known local banking house, is said to have the matter in charge.

Mr. Herbert O. Confarr, of Bentonville, Ark., writes to the ELECTRICAL REVIEW that Bentonville, population 2,500, needs an electric light plant, waterworks and cold storage plant. He would like to confer with manufacturers on the subject.

The annual meeting of the Union Traction Company of New Jersey was held at their office in Jersey City, N. J., last week, and the following officers and directors were elected: H. C. Adams, president; D. A. Pell, vice-president; H. H. Copeland, treasurer; F. Bourne, secretary. Directors, H. C. Adams, D. A. Pell, H. H. Farrier, H. H. Copeland, J. S. Forgotston, C. J. Field, H. C. Broking, Samuel Taylor, A. W. Dickinson, F. Bourne, H. C. Adams, Jr.

An alternating-current arc lamp is soon to be brought out by the Manhattan General Construction Company, 44 Broad street, New York. It is said to possess many new points of value. The lighting people will be pleased to learn more about the lamp as soon as the owners are ready to introduce it, which will be soon.

EXHIBIT OF THE SAFETY INSULATED WIRE & CABLE COMPANY, OF NEW YORK, AT THE NATIONAL ELECTRICAL EXPOSITION, NEW YORK CITY.

A Novel Roof Garden.

The many friends in the electrical field of Mr. L. R. Mestaniz, of the Industrial Building, New York city, will be interested to know that on June 28 he will open a novel roof garden on top of the Industrial Building. A covered enclosure contains seats for 3,000 people. The open roof will seat many more. Between the covered portion and the open space is a revolving stage. In case of rain the audience can be quickly moved to the enclosed space and the stage turned around to face the seats. The Industrial Building management is a firm believer in electric lighting and the new roof garden will be liberally illuminated.

The statement is made that, of the required $150,000 capital, $85,000 have been subscribed for an electric line from Worcester to Clinton, Mass.

ON PHOSPHORESCENT DIAMONDS.

READ BEFORE THE NEW YORK ACADEMY OF SCIENCES, BY GEORGE F. KUNZ.

The luminous properties of gems have been referred to from the earliest times. The phosphorescence of the diamond was treated at some length by Robert Boyle in 1666, and by Du Pay in 1751. Only certain diamonds emit light or phosphorescence on exposure for a time to the rays of the sun, or of electric calcium or other intense light. The various colors of the diamond are evidently due to the presence of hydro-carbons, similar to those which are artificially made in such endless variety and of all known colors, and which often fluoresce and phosphoresce. After a personal examination of a great number of diamonds, it appears that only certain ones fluoresce on exposure to the ultra-violet rays of an electric or other strong light, and from the observations made it is very evident that this fluorescence and phosphorescence is a property only of those diamonds that contain a certain bluish-white substance, and it is this substance that fluoresces and phoresces, and not the diamond. This is, undoubtedly, a hydro-carbon, for, as stated above, this property of fluorescence and phosphorescence is marked in many hydro-carbons, notably anthracine. I therefore think it would not be inappropriate to give this substance a definite name, and I propose that of Tiffanyite.

Weston Engine Company.

The Weston Engine Company, of Painted Post, N. Y., whose plant was recently destroyed by fire, have leased a temporary plant, which will enable them to carry out all their contracts with the exception of those for automatic engines. Within a few days the company hope to be able to fill orders as usual. They expect to rebuild their plant at Painted Post on a much larger scale.

EXHIBIT OF THE UNITED STATES MINERAL WOOL COMPANY, OF NEW YORK, AT THE NATIONAL ELECTRICAL EXPOSITION, NEW YORK CITY.

EXHIBIT OF THE DIEHL MANUFACTURING COMPANY, OF ELIZABETHPORT, N. J., AT THE NATIONAL ELECTRICAL EXPOSITION, NEW YORK CITY.

ELECTRICAL REVIEW

Times Building, 41 Park Row,
P. O. Box 2339. NEW YORK.

EDITOR:
CHARLES W. PRICE.
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REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.

1546 "CORTLANDT," TELEPHONE CALL.

SUBSCRIPTION TO THE
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy, - - - - - - - - .10
Back Copies, each, - - - - - - .25

SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, JUNE 3, 1896.

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The results of the terrible storm which created such havoc last week in St. Louis and vicinity are not yet completely scheduled. The loss of lives reaches into the hundreds, and millions of dollars worth of property was destroyed. The electric railways, lighting stations, telephone and telegraph companies all incurred heavy losses which are now being repaired as rapidly as possible. The ELECTRICAL REVIEW extends its sympathy to the stricken city.

ELECTRICAL OSCILLATORS.

We learn with pleasure that Mr. Tesla's electrical oscillator, for use on ordinary circuits, is to be introduced very shortly. The devices are of ideal simplicity and require practically no attention.

We feel sure, from the evidences we have received, that the scientific as well as the practical world will be deeply grateful for Mr. Tesla's unceasing efforts in this field.

RAPID TRANSIT IN NEW YORK CITY.

Now that the courts have decided that an underground rapid transit road can not be built in New York city, the only hope held out to the traveling public is the extension and improvement of the elevated railway system. The recently enacted law compelling the Manhattan Railway Company to equip its passenger cars with a proper illuminant may prove to be a potent factor in forcing the company to adopt electricity as a motive power as well as for illumination. We judge that New York city is nearer to electrical rapid transit than ever before.

THE TELEPHONE-TELEGRAPH SITUATION.

Students of the telephone-telegraph situation are predicting that the many telephone companies of the country working under licenses from the American Bell Telephone Company, and virtually owned by it, will soon become one large company, doing away with the many separate organizations. While this may come to pass in due time, we think the change will be a very gradual one. Should the relations now existing between the Western Union Telegraph Company and the American Bell be seriously changed by the expiration of their contract next November, this concentration of the telephone organizations may be hastened.

LIGHTING BY VACUUM TUBES AT THE ELECTRICAL EXPOSITION.

Since about five years ago an impetus was given to the subject of lighting by means of vacuum tubes, the development of methods and devices has engaged the attention of a great many workers in the field here and abroad. Quite a little excitement was caused about two years ago by Messrs. Pyke and Harris, in London, who lighted halls with a great number of such tubes by the use of a high-frequency alternator, which, we understood, was driven by a motor operated from an ordinary supply circuit.

The interest in this subject has gradually increased to such a degree, and the fascinating ocular effect of this form of light is so attractive, that even so impractical an effort as that with which Mr. D. McFarlan Moore entertained the visitors to the Electrical Exposition has received attention that under ordinary conditions would be entirely impossible. Mr. Steinmetz and other members of the American Institute of Electrical Engineers called attention to the enormous expenditure of energy (seven and one-half horse-power) required to produce an insignificant amount of light, hardly equivalent to a few incandescent lamps. Charitably the discussion was not pushed very far. According to Professor Anthony's approximate estimate, the energy consumed merely by about 16 tubes was over one horse-power, and, considering the quantity of the light evolved, it was hardly one-eighth of that which could have been produced by incandescent lamps with the same expenditure of energy. It is fair to say that about four good Crookes phosphorescent bulbs would have given as much light with much less expenditure of energy.

But the point which interests us is not as much this, as the operativeness of the devices employed, which, without prejudice, we seriously question. Each tube has a vibrator which is supposed to perform nearly 9,000,000 vibrations every 24 hours! Disregarding entirely the deterioration of the contacts and the impairing of the vacuum, the mechanical difficulties are known to be such as to preclude the successful continued use of this device.

Mr. Moore states in the New York *Herald*, of May 24, that "but little headway beyond what was known for 200 years" was made until he made his "gigantic stride," and that the efficiency of his apparatus was "11,000,000 per cent better than that used by Tesla." These preposterous statements are quite in keeping with a communication which we have received from the Moore company, containing such remarks about Edison and Tesla as to make it impossible for us to dignify it by publication in our columns.

Mr. Geo. C. Maynard, a well known electrical man of Washington, D. C., was an Electrical Exposition visitor last week. Mr. Maynard is looking up historical and other interesting electrical apparatus for the Smithsonian Institution.

THE FINANCIAL SIDE.

The disposition of Wall Street bull interests to ignore exceedingly favorable crop conditions, the growth of sentiment in favor of sound money and important developments in the railroad world, among them the decision upholding the Joint Traffic Association, left the market to the mercies of bears, who hammered it off and on with more or less success. The close was on a lower basis than last week. This refusal of money to take hold of stocks at this time is undoubtedly based upon a decision to determine with more certainty the Republican attitude on currency matters. For this reason the next great stimulus to prices will undoubtedly be the action of the St. Louis convention. A history of the stock market is nothing more nor less than a record of professional operations aimed to scalp profits of eighths and quarters.

The traction situation in New York is just now full of interest. Among the new developments this week was the decision of the Manhattan Elevated board of directors to submit to the authorities a plan of extension, and the appointment of a committee to report definitely thereon. The great majority of financial men do not believe that any proposition will be made that can be seriously considered by the city, and for this reason prolonged delay is expected. It is not the opinion of the Rapid Transit Commission that a new line is feasible, as there would not be business enough for the two and the Metropolitan Traction Company. The acquisition by the latter of the Fourth avenue line, as stated in this column last week, is a very severe blow to the elevated people. Equipped with a fast motor, it will be a second Broadway. Talk of a lease of Manhattan by the Metropolitan Traction Company has been revived. There are well posted men who believe that this is the only feasible solution of the New York rapid-transit problem.

The papers have been full of talk all week concerning a wonderful air motor that has originated at Worcester, Mass., and which is to be adopted on various surface lines in the country, especially those of New York, Philadelphia and Chicago. The testimony of competent engineers who have examined the motor is against its practicability. But this does not prevent its owners from accomplishing a purpose through extensive advertising. Just what this is, does not appear. By some it is claimed that the success of the electric conduit system on the Lenox avenue line, vouched for by the fact that the apparatus has been taken over without reservation or stipulation, and paid for by Metropolitan people, will prove an eye-opener to large cities where the overhead trolley is used, and that talk of an air motor, or some similar invention, may postpone the inevitable substitution of the conduit system. Most of the glowing accounts come from Philadelphia, the headquarters of a clique of capitalists that have been conducting the air experiments, and who have rather a loose grip on an enormously over-capitalized street railway system.

It is very safe to conclude that electricity is in no danger at this stage of development of being superseded by air. I was shown a list a yard long of mining companies which have taken air motors out of their underground workings, substituting electrical apparatus therefor. If there is any branch of industry where air could be used to greater advantage than any other power, it is in the mines.

I learn that the Love Electric Traction Company, of 1 Broadway, of which General Dodge is the president, A. G. Wheeler, secretary, H. Walter Webb and J. Edward Simmons among the directors, is really the corporation back of the General Electric Street Railway Company, of Chicago. It has plenty of capital and unlimited backing and will start within a few weeks to construct a line parallel to, and one block away from, the Chicago City. Its concessions will allow it to build 20 miles of track and it has in project 50 miles. The conduit system is to be used, and electric apparatus, valued at something like $300,000, will be installed.

General Electric shot up to 36½ on Saturday, and almost immediately relapsed, touching 33⅝ on Thursday. On the decline, stories of opposition from an alleged new concern, the Walker company, which, by the way, has been doing an excellent business for some years, were used with effect. I have reason to believe that the stock was accumulated on the way down, and that on the next distinct turn of the market it will be advanced to the neighborhood of 40. The debenture bonds sold in a limited way during the week at 93. BAIN.

New York, May 29.

Death of Kate Field.

Miss Kate Field, the well known actress, author, lecturer, publisher and newspaper writer, died in Honolulu, Sandwich Islands, on May 19, of pneumonia, according to advices received last Saturday. About 1879 she contributed an article on the telephone to the London *Times*, and sang through the then novel invention to Queen Victoria.

Radiography in Germany.

[*Cable to the New York Sun.*]

BERLIN, May 28.—The General Electrical Society announces that an improvement has been made in the Roentgen process that enables the interior of the head, the larynx and the action of the lungs and the heart to be observed on a fluorescent screen.

The Woburn, Mass., Electric Light plant and business finally passed out of the hands of the court on May 15, and was formally turned over by the receivers to the new organization. The new officers are W. B. Littlefield, president, and L. J. Moulton, treasurer.

EDISON'S X-RAY LIGHT.

STILL AN OBJECT OF INVESTIGATION BY THE RESOURCEFUL INVENTOR.

"Sit down and let the sunlight get out of your eyes," said Mr. Edison to the ELECTRICAL REVIEW representative as he ushered him into a dark room at his laboratory late last Friday afternoon. "Do you know," he continued, "that a great change takes place in the human eye when it leaves the light and enters darkness? It requires a few minutes of preparation and the objects become more distinct and the eye is ready for its best work. This explains the darkened approach to the X-ray exhibit at the Electrical Exposition. A wonderful thing, the eye!"

While talking Edison had arranged his new lamp—shaped like an extended egg—suspending it from two terminals in the middle of the room—a room about 20 by 15 feet, 11 feet from floor to ceiling. On the table near his chair were the primary and secondary coils used in producing the X rays from the electric current. The only other persons in the room were his laboratory staff, all taking a deep interest in the work. The current was turned on for a moment and a soft, clear-white light was emitted from the bulb—a light that one had difficulty in realizing was only one candle-power, as it lighted up the room so well that the lettering on a visiting card could be easily read. The current was turned off and on a number of times, the bulb when aglow showing the mineral coating mentioned in the ELECTRICAL REVIEW last week, and which gives the bulb the appearance of a frosted incandescent lamp. Mr. Edison stated that one of his visitors had taken his photograph by the light after an exposure of 30 seconds.

"The tests we have taken indicate that we can get about 1,200 of the one candle lights to the horse-power," continued Mr. Edison, "but just how successful as a commercial light it may become I can not state. The light seems to be all right. It was tested to-day by Mr. N. W. Perry, who brought a spectroscope with him, and the chief difficulty I see is to make the apparatus practicable. This lamp is now taking a current of two amperes and the drop of potential across the primary is three-tenths of a volt. The current is interrupted 2,50 times per second. It is closed four-fifths of the time and opened one-fifth of the time. The average spectrum of light is a lower refrangibility than arc light or Welsbach gas mantle. A globe six inches in diameter will give eight candles. The best commercial lamp requires three and one-half times the amount of energy per second required in this lamp. I intended to have a larger bulb to-day, but my lamp man did not get a suitable one finished."

The REVIEW representative suggested that the small amount of energy required for the new light might open up a field for the primary battery.

"That's a good idea; I hadn't thought of it in that connection," quickly replied Mr. Edison; "Mallory, send for 30 or 40 Edison-Lalande cells and we will give them a trial."

The visitor left, convinced that the full merits of the new light would be thoroughly tested from the severest practical standpoint before the father of the incandescent lamp would permit this new child in the illuminating field to supplant in his affections his well beloved first born. In fact, Edison stated he had been at work on improvements that showed him that 20 incandescent lamps to the horse-power were obtainable—virtually halving the cost of the present lighting.

At the door, as the newspaper man left, were Mrs. Edison and her little daughter, with the Edison carriage ready to take the tireless inventor to his delightful home in the center of Llewellyn Park, a beautiful park of the Orange mountains that sweeps the laboratory doors.

ELECTRIC RAILWAY NOTES.

George Westinghouse, Jr., president of the Westinghouse Electric and Manufacturing Company, was reported last week as saying: "The use of electricity on the branch of the Pennsylvania between Burlington and Mount Holly, N. J., has been a success, but it is yet too early to discuss the adoption of electricity on the main line. We have perfected a system which we are convinced will work satisfactorily on the elevated roads here. An experimental line is in operation at our works, and George J. Gould is going over to Pittsburgh to see it."

President Clinton L. Rossiter, of the Brooklyn Heights Railroad, of Brooklyn, N. Y., is so well satisfied with the results following the setting apart of recreation quarters for the road's employés in the new Greenpoint car house, that similar quarters are to be arranged for the men in the Ridgewood car houses, where 800 men gather at different hours of the day. A fine lecture or entertainment room will be fitted up in the car house, and there will also be bathrooms and other conveniences. The men will be allowed to read books and newspapers and play games during "off hours." The new car house in South Brooklyn will also be fitted up in a similar manner for the road's carpenters, painters and other workmen.

Last week the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., awarded $10,000 in money prizes to the conductors and motormen in their employ for faithful and efficient service during the year. The money was divided between 1,139 motormen and conductors, and there was an average of about $9 a man. President Rossiter caused $10,000 to be set aside a year ago as an incentive to the employés of the company to use the utmost care in the discharge of their duties, in order to avoid accidents. The rules under which the competition was established stipulated that all those who had a clear record on the company's books up to May 1, 1896, should receive an equal share of the prize money.

The Patent Office Models at the Electrical Exposition.

If we include in the model exhibit at the Electrical Exposition the collection from Washington, the personal exhibits of T. A. Edison and Prof. Elihu Thomson, as well as apparatus contributed by at least a score of schools, colleges and private individuals, it will be found that the models and pieces of machinery in this section reach the extraordinary total of 750.

One feature is forcibly impressed on the mind of the student of the long cases of 365 models from the Patent Office, and that is, that while countless efforts are expended upon the development of each new branch of electricity, only one or two principles appear to be fundamentally and commercially correct. In the wonderful collection of telegraphic apparatus, for example, dating back as far as 1849, and thus bringing us in touch with the first rivals of Morse, there is little to be discovered that is extant to-day, although marvels of ingenuity were carefully worked out by such inventors as House and Bain, and vigorously exploited by some of the shrewdest and most daring capitalists this country has known. One after the other the chemical and multiplex and pantagraphic systems have gone down, until to-day, outside of the original simple Morse methods, there is little left to speak for well-nigh half a century of persistent endeavor to improve and change. The same remark is shown by these cases to be no less true of the telephone. It is seen that apart from the original Bell apparatus, the main principles of which are still faithfully observed in most of the apparatus that the public has to handle, the bulk of invention has gone into the development of systems or multiple connections, giving the user of the telephone ready connection with other subscribers.

What is most remarkable is that many of the fundamental forms of incandescent and arc lights, and the dynamos to furnish current for them, still remain in vogue, although they have undergone improvement. One can go from the models of arc lamps shown in the cases directly to some of the commercial exhibits in the hall and trace a direct and continuous line of evolution extending over a period of 15 or 20 years.

It is needless to add that the Patent Office collection includes a great many inventions that might be styled "freaks," although it is always risky to say of any electrical invention that it might not, some day or other, become feasible or practicable. Thus there is an electrical whaling apparatus of 1852, although the same idea has been lately presented to the public as an absolute novelty. Another patent relates to a method for painting telegraph wires, dating back to 1849. Professor Morse tried a scheme of this kind when he put beeswax upon his wires for insulation and demoralized the bees of a whole State. Nowadays electric wires are insulated, but not painted, and there are many models relating to methods of insulation. As far back as 1876 is a model for an electric light buoy; yet the adjacent Gedney Channel buoys, loaned by the United States Lighthouse Board, are regarded by the crowds of visitors as a great curiosity, and are part of the only set existing in the world.

It would not be fair, in speaking of the models of the exhibition, to refrain from mentioning those connected with the power plant at Niagara, one of which, it will be remembered, is operated in part by live energy from the Falls itself. There is also a magnificent model, built in Switzerland, of the 5,000 horse-power turbines, and one of the great tunnel that carries off the waste water. Another collection of models in one of the exhibits illustrates beautifully the principle of the Tesla rotating field, gyroscopes, tops and disks of metal being made to rotate violently in the air unconnected with anything, under the influence of the shifting currents. Mr. Edison's personal collection contains models similar to those upon which many of his earlier patents were secured; one, for example, being his vote-recorder, for which he took out his first patent, his idea being to render voting easy. He now says that another invention is required in legislatures to render talking difficult—something in the nature of a mechanical cloture.

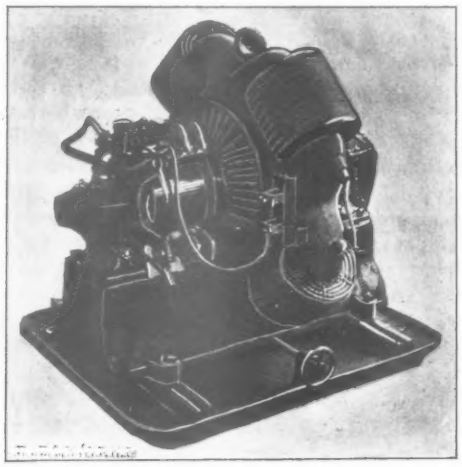


FIG. 2.—C. & C. ELECTRIC COMPANY'S NEW TYPE FOUR-POLE MOTOR.

FIG. 3.—C. & C. ELECTRIC COMPANY'S RHEOSTAT.

Apparatus of the C. & C. Electric Company.

The C. & C. Electric Company, 145 Liberty street, New York city, are the manufacturers of the apparatus illustrated on this page. On page 283 is shown this company's multipolar dynamo for direct-connected service.

The speed of this machine is such as will permit of direct attachment to the best class of engines. The regulation is automatic and within two per cent. The brush movement is zero under all variations up to 20 per cent overload. The insulation is 1,000,000 ohms from conductor to frame. The ventilation is such as to insure a complete circulation of air under all conditions of practice. The commercial efficiency is claimed to be from 90 to 95 per cent, depending on the size. The design of the machine is up-to-date and fully modeled to include the recent improvements.

In Fig. 2 is shown the company's new four-pole motor. This machine is built in two sizes up to and including 25 horse-power, and is distinctly a slow-speed machine intended for the higher class of service, in which is included all kinds of direct applications—elevators, hoists, printing presses, etc. The magnetic circuit is exclusively of steel and is so arranged that there are but half as many joints as is ordinarily the case with this type of machine. The running value of the type is such that the temperature increases but a very little under full load, the efficiency is quite as high as is the case with the best dynamo practice, and the commutation is absolutely sparkless without brush movement. These machines are now practically ready for the market in all sizes and the company expects a very considerable increase in business as a result of this advance application.

In Fig. 3 is shown the type of rheostat used by the C. & C. Electric Company.

Storage Battery Plant for Hartford, Ct.

A water power of about 3,000 horse-power, situated about 11 miles from Hartford, Ct., will be used to drive Westinghouse multiphase alternators, the power to be transformed at the falls to 10,000 volts and transmitted on a pole line to the Hartford Electric Light Company's station in Hartford, where it will operate motors driving shafting, to which will be belted arc lighting machines, and from which point alternating current will be distributed for incandescent lighting.

From the station mentioned the current will be carried to the storage battery station at a pressure of 2,000 volts, where it will be transformed to 240 volts and put through a rotary transformer for charging the battery, which will be operated on the three-wire system. The battery will consist of one hundred and forty 10,000-ampere-hour chloride accumulators supplied by the Electric Storage Battery Company, of Philadelphia.

RECENT DEVELOPMENTS IN VACUUM TUBE LIGHTING.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, APRIL 22, 1896, BY D. McFARLAN MOORE.

(Concluded from page 281.)

Closely allied with the subject of insulation is that of frequency. The higher the frequency, the lower the potential can be, not only with respect to light, but also to insulation, because irregularity in the rate of vibration puts the insulation to a severe test. However, the period of the vibrator is not rapid as compared to that of alternating dynamos, constructed to obtain similar lighting effects, but resulting in those of lesser degree. The alternations of such a machine are about 30,000 per second, which is further increased by a disruptive discharge coil. This was necessary to compensate for the long wave lengths of the current. But since these lengths are so much shorter in the vacuum vibrator current, an initial frequency one-fifth as great, without the use of additional coils and condensers, produces far better results. But that an ordinarily constructed vibrator can attain a speed of 6,000 per minute may be questioned, when it is remembered that induction-coil vibrators work at a rate of but a little over 1,000. The difference lies in the fact, that the vacuum vibrator has no air pressure to impede its movements, and also that a much shorter space of time is required for a single complete interruption, because the actual mechanical movement can be much less, yet cause a complete break, and another cycle has begun. The speed of the vibrators is ascertained in two ways; first, by comparing the musical note it produces with that of a pitch pipe, and secondly, by a visual arrangement constructed and operated as follows:

A shaft, supporting a wheel with one spoke, is rotated rapidly by hand, a series of multiplying gears being used, so that, when the hand makes one revolution per second, the spoke makes 20. When this apparatus is operated in a room lighted only by a single vacuum tube, the spoke will appear stationary in one, two or three positions, according to the rate of the vibrator. For example, if the spoke appears stationary in two positions, it indicates that it is illuminated twice in a single revolution, each image being due to a vibration.

Another subject which has been a serious obstacle in former proposed systems is that of impedance. The fact that the best conductors would cease to transmit current seemed a difficulty almost unsurmountable, yet it appears to be almost absent under these new conditions. For example, when a large coil is inserted in the high-potential lead from the armature terminal to the tube the effect on the light is surprisingly small. The result is the same, whether the wire be in the form of a magnet or in a long, exposed line. But, nevertheless, on account of line losses, it is advantageous to prevent condenser action by using a wire as small as possible, yet able to stand the strain it is subjected to when its insulation is being placed upon it. Although the light produced by a single wire is quite good, it is decidedly advisable for best results to use a return wire, because the fundamental frequency is so low.

The third subject—economy—is so large and of such importance that I deem it expedient to make it the subject of a future paper, when accurate measurements have been made. Indeed, it is second only—but it is second—to the nucleus of the whole investigation, viz., getting light. The efficiency of the lighting tube is well established, due principally to the great amount of light accompanied by so little heat, that it has by some been called "cold" light. The temperature of the gas within the tube varies with the density of the discharge from 12 to 132 degrees Centigrade; but even this is improved by the shorter wave lengths. These figures are extremely low, as compared with temperatures as high as 3,500 degrees Centigrade, which must be reached by some substances in order that the light be white and the spectrum complete.

Owing to the peculiar characteristics of the current, the line losses are materially decreased, and the current flowing through the primary circuit is less when the tube is giving light than when it is disconnected. There are almost no losses for motive power to disrupt the current, for the magnet is its own motor. But the greatest loss has always been in the disruptive discharge, the spark. It is remarkable how easily several horse-power can be dissipated in the air through the intervention of a disruptive discharge. In this connection it should be borne in mind that magnetic blowouts and air currents are merely heat dissipaters, and increase the loss, while these losses are entirely obviated by the vacuum vibrator. The current can perform a large amount of work on the air, unlimited in volume, with no apparent results; but when this volume is reduced to the compass of a small vibrator tube, which remains perfectly cool in operation, does not the question of efficiency assume a different aspect?

Upon these reasons may be based logical conclusions, pointing to an enormous increase in efficiency over that of all other methods of obtaining light in tubes.

The theory which has just been considered, of course, is not limited to a simple vibrator, but applies broadly to any method of interrupting the flow of current through a high vacuum. This can be accomplished in a great variety of ways, although, as far as simplicity of apparatus is concerned, the regular spring vibrator, in connection with a single magnet, probably can not be improved upon.

The first deviation, however, is to use a very small magnet to vibrate the armature, and to connect this in series with a larger one to furnish the induction. But in these cases the power of the operating magnet depends on the current passing over the contact points; hence, to make the light which is dependent on the contact points perfectly positive, the power should not be dependent upon them, and separate circuits suggest themselves—that is, cause an intermittent current to flow through the power magnet that does not flow through the contact points of the vibrator, which have in circuit with them the inductive magnet. Or the electrodes can be separated by mechanical jarring instead of magnetic power acting through the glass.

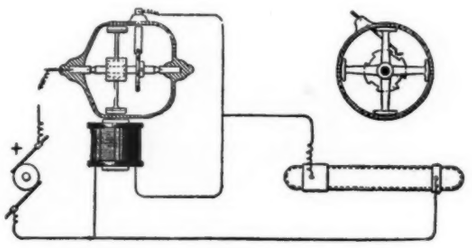


FIG. 31.—VIBRATOR USED IN CONNECTION WITH VACUUM TUBE LIGHTING.

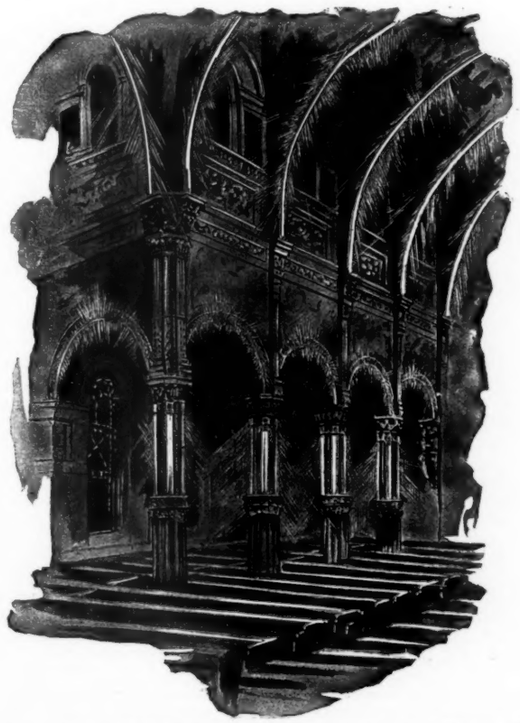


FIG. 32.—PROPOSED METHOD OF CHURCH ILLUMINATION WITH VACUUM TUBES.

If an ordinarily constructed vibrator be attached to any form of rapidly oscillating mechanism, the contacts within will be opened and closed rapidly. But, in order that the light be steady, the movements of the vibrator armature must be in step with the movements of its mechanical support. This is best accomplished by having the center of the oscillation of the vibrating armature coincident with that of its oscillating support.

It is plain that it is unnecessary that the current be interrupted by a reciprocal motion only; a rotary motion is also applicable.

Fig. 31 shows a form somewhat analagous in operation to the simplest vibrator, except that the rotary momentum of the armature takes the place of a spring, and the break-wheel, which furnishes the light, also acts as a commutator to the simple form of motor.

Another way of obtaining a rotary motion within a vacuum is to attach a pendant weight to a ratchet wheel, free to rotate upon a shaft, attached to which is the brush. Since the shaft is rigidly sealed into the glass, it is evident that when the bulb be rotated by a motor the brush will revolve around the break wheel. The fault with the device is that the pendulum will have a vibration of its own, causing the light to waver.

In order that the make-and-break devices dependent upon a rotary motion be absolutely positive, a rotating magnetic field has been utilized. Since the experimental side of these investigations has extended over but a few months, it is at present difficult to say upon which of these methods developed the system will take final form.

Returning once more to the subject of the light in the tube, it is interesting to note that, although the most intense light is produced when both of the ends of the tube are connected to the electrodes, it is well known that light also results when the tube is merely placed near an electrode without actual contact. This phenomenon is known as lighting by induction.

If an inductive circuit sufficiently powerful to brilliantly illuminate a tube four feet long be transferred to one two feet long, there will appear at the center of this small tube a very intense thread of silvery-white light, which undulates as if it were a material substance. It is interesting to contrast the color of the light of these tubes with that of an incandescent lamp. The reddish and wasteful glare of the latter, indicating heat waves, and the pure daylight white of the former are immediately apparent. It is this difference in color that makes an efficiency calculation so difficult. It is very easy to ask the question, How many watts per candle-power? But in most instances it indicates a lack of information on the part of the questioner. The question should be: How many watts per amount of light equivalent to one candle-power? But even this is not perfectly correct, because it is well-nigh impossible to compare accurately lights of a different color and power of diffusion. When the use the light is to be put to is stated, the problem is much more simple. For instance, if it is to be used to read by, the range of legibility can be made the basis of comparison between the true glow lamp and the candle. This most popular form of illumination, from the twelfth to the beginning of this century, is still the standard of illumination, although it is probable it will soon be deprived of this honor. I may be pardoned for calling your attention to the remarkable intensity of the light in these tubes, in connection with the statements repeatedly made by eminent

scientists, that such intensity was an impossibility, and that efforts in this direction were comparable to those wasted on perpetual motion. It is merely another instance of history repeating itself, in that in all times the inertia of the learned has interfered more with the progress of science than has ignorance. Be it remembered that the commercial incandescent lamp was an acknowledged impossibility among scientific men, and that by them the proposed Atlantic cable was considered foolishness. If there be but one lesson taught by our times, it is condemn nothing new in religion, science or art without thorough investigation, and even then be careful, because many suggestions, though of little value themselves, have led to great advancement. It is also well to remember that there is almost a creative force in the spirit that is earnest and courageous. The light having reached the intensity, as you see it in this tube, it is questionable whether much greater intensity is wanted. The vibrator, as applied to the electric bell, was the first practical application of electric power, and to-day we see the same vibrator in a "new light."

The very nature of the light, if it is to be counterpart of the ideal daylight, is such that, when a square inch of the surface of the tube emits as much light as that thrown into a room through an aperture one inch square, the want is satisfied. Then the desired illumination can be reached by multiplying the area and length of the tubes, and distributing them in the most advantageous manner; that is, so that the light will fall from all directions. When a considerable area is to be lighted, the most efficient light is the one that is most equally distributed. However, there will always be a demand for units of light. Even this can be satisfied by using a tube of small calibre. This lamp is made by winding a small tube in the form of a spiral, its ends, to which the wires are attached, terminating in oblong bulbs three or four times the diameter of the small tube.

I have previously stated that the alphabet has been constructed of tubes of light. Here are the initials of the body I have the honor to address, A. I. E. E., in letters 12 inches high. The delicate shades of these letters can not fail to elicit admiration from all who love the beautiful.

The principle of breaking a circuit in a vacuum has many applications to a variety of uses. Among them may be mentioned, advertising signs, decorative electric lighting, electrotherapy, philosophical apparatus, theatrical effects, in the manufacture of ozone, in the kinetoscope, etc.

But the greatest field will ultimately be that of general illumination. You have noticed the tubes extending around this hall. Undoubtedly this is the first time that lighting by tubes has been attempted on so large a scale. You will note the almost entire absence of shadows.

Fig. 32 illustrates what we are coming to in the way of church lighting. For some time past everything has pointed to the general adoption sooner or later of some such form of illumination, and since volumes of light can now be produced, and of commercial intensity, does it not indicate that already this light is a matter for serious practical consideration, and no longer a pyrotechnic curiosity?

But the only way in which one can form a comprehensive or appreciative idea of what advance in this line of work really means, is to compare the situation of to-day with that, not of 100 years ago only, but with that of only 12 months ago, and note the contrast.

EFFECT OF TEMPERATURE ON INSULATING MATERIALS.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, MAY 20, 1896, BY GEORGE F. SEVER, A. MONELL AND C. L. PERRY.

In designing electrical apparatus it is often of the greatest importance to know the effect of different temperatures on the insulation to be used in its construction.

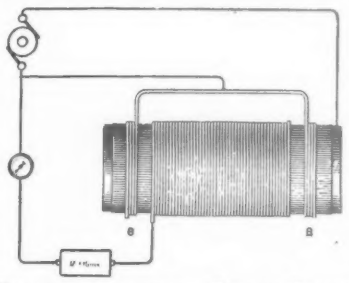


FIG. 1.—APPARATUS FOR TESTING EFFECT OF TEMPERATURE ON INSULATING MATERIALS.

Of the many kinds of insulation a few of the most common were chosen—*i. e.*, paper, cloth, oiled paper and oiled cloth—and the following conclusions have been drawn from the result of 102 tests on samples of materials which were kindly furnished by several of the most prominent manufacturers of electrical machinery.

THE APPARATUS.

The heating apparatus consisted of a glass cylinder eight inches in diameter and 10 inches high, covered at the top and bottom with asbestos plates. The lower part of this cylinder was occupied by 12 enamel resistance tubes, five inches long, and 24 ohms each. The terminals of these were brought out through the asbestos plate. The current in these tubes being controlled by a rheostat, the temperature in the cylinder could be varied at pleasure. An inch above the heating tubes, and supported by an asbestos collar, was a metal plate having holes punched in it to allow the free circulation of air in the cylinder. This plate was connected to one side of a galvanometer.

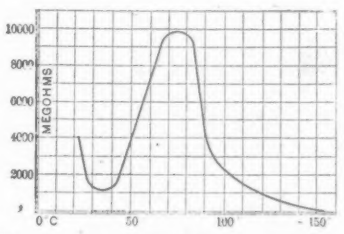


FIG. 2.—PLAIN RED PAPER .009 INCH THICK. CHARACTERISTIC PAPER CURVE.

The insulating material to be tested was wrapped on brass cylinders three-quarter inch in diameter and three inches long, the insulation not reaching quite to the end of the tube. The insulation was then wound with No. 26 Brown & Sharpe bare copper wire for a space of two and one-half inches. Five tubes so wound were then placed on the metal plate in the cylinder and their terminals brought up through the asbestos cover, and then to a switchboard, in order that any tube might be thrown into the galvanometer circuit. This arrangement made it possible to heat five specimens at one time.

With the above apparatus was used a Thomson high-resistance galvanometer, a megohm box and a difference of potential of 500 volts.

The thermometer used was of the nitrogen-filled mercurial type, and capable of measuring from 0 to 400 degrees Centigrade.

When troubled with surface leakage, it was eliminated in the following simple manner. The diagram shows the connections while testing a tube, and also the leakage shunt.

It will be seen from the diagram, Fig. 1, that all of the current going through the galvanometer must pass from the dynamo to the brass cylinder, and thence through the insulation to coil A and on through the galvanometer. Any current tending to leak over the surface of the insulation from the brass cylinder to coil A will be intercepted and shunted past the galvanometer by coils B B.

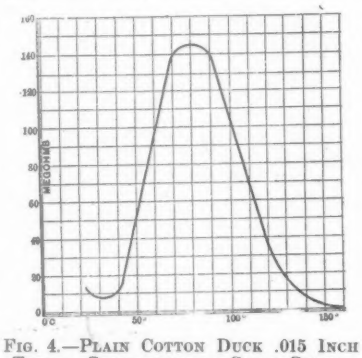


FIG. 4.—PLAIN COTTON DUCK .015 INCH THICK. CHARACTERISTIC CLOTH CURVE.

During the investigation many different specimens of paper, oiled cloth, etc., varying greatly in thickness and composition, were tested, and it was found that each class has its characteristic properties strongly marked. We will now proceed to the discussion of each particular class.

PLAIN PAPER.

In this class 40 specimens were tested. After the resistance at the temperature of the air (22 degrees Centigrade) was carefully noted, the temperature was gradually increased (100 degrees in one-half hour) and readings taken every 10 degrees up to 80 degrees, and from there on every 20 degrees. Fig. 2 shows a curve which is characteristic of practically all kinds of plain paper.

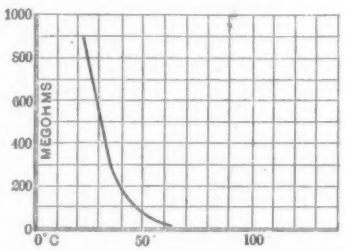


FIG. 5.—OILED PAPER .0045 INCH THICK. CHARACTERISTIC CURVE.

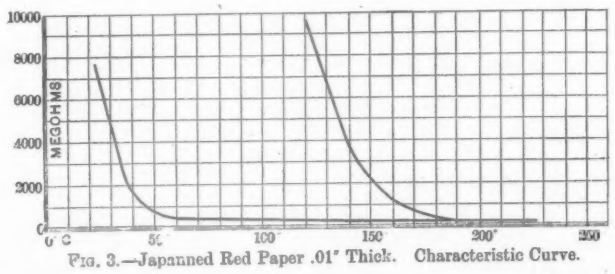


FIG. 3.—Japanned Red Paper .01" Thick. Characteristic Curve.

It should be noticed, however, that, in general, the resistance of papers that are not protected from moisture falls between 22 degrees and 50 degrees, and then rises rapidly, until at 75 degrees it has attained a maximum resistance. It should also be noted that this temperature of 75 degrees is very constant for all kinds of paper. From 75 degrees upward the resistance falls rapidly, and at 150 degrees is but a small fraction of its initial resistance.

The initial resistance of paper protected from moisture by japan (Fig. 3) is very high, but falls rapidly with the increase of temperature, as is the case with all material protected from moisture. (See oiled paper and oiled cloth.) Hence we see that all paper having a porous structure, and therefore containing more moisture, has a lower initial resistance than the protected paper, but is affected by heat much less than the latter. This would lead to the conclusion that there are two phenomena taking place. First the driving off of the moisture, which tends to increase the resistance, and secondly, some change (not a mechanical deterioration) in the material, dependent on the temperature, and which may be called the temperature coefficient. This temperature coefficient tends to lower the resistance with increase of temperature.

Examining the several curves shown, we see that the initial resistance of unprotected papers is low on account of the presence of moisture. Now, on gradually increasing the temperature, the resistance falls during the first 20 or 30 degrees, because the effect of the temperature coefficient predominates during this period and before the material is warm enough to start the evaporation of the moisture it contains. This, however, lasts but a short time, as the result of the evaporation is to increase the resistance very rapidly, until, at 75 degrees, the temperature coefficient again asserts itself and the resistance rapidly falls.

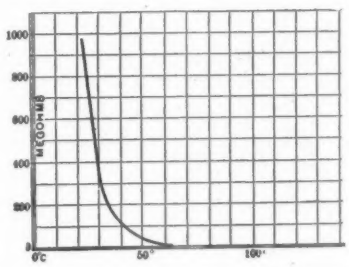


FIG. 6.—OILED SILK .007 INCH THICK. CHARACTERISTIC CURVE OF OILED CLOTH.

In the case of japanned papers, Fig. 3, the initial resistance is very high, due to the absence of moisture, but on being heated the resistance drops rapidly as the small quantity of water contained is evaporated off so slowly that it has very little counteracting effect on the temperature coefficient.

Paper does not seem to deteriorate mechanically at less than 180 degrees; above this point the material begins to carbonize. At 230 degrees a peculiar phenomenon takes place. The material, after possessing a very low resistance from 175 degrees upward, would at about 230 degrees suddenly increase greatly in resistance and immediately after break down. This may be caused by some molecular rearrangement taking place at that temperature, which changes the resistance of the material. Other cases wherein the resistance of a body changes at a certain temperature are well known. In the phenomenon of "recalescence" a piece of iron or steel, after having been heated to a bright redness and allowed to cool slowly, will, at a certain stage of the cooling process, receive a sudden check. Heat being generated in the metal as

a result of the change which the molecular construction suffers at the critical point, the cooling is arrested and the temperature and resistance rise, though the loss by radiation is still going on.

The experiments of F. Kohlrausch and Hopkinson have also shown that the critical temperature is marked by a sudden change in the coefficient which expresses the effect of temperature on the electrical resistance of iron. This is also true of nickel.

It would seem that paper insulation has a critical temperature somewhat analogous to that of iron, steel and nickel, but, of course, the characteristics of the materials are too different for any close similarity.

PLAIN CLOTH.

Under this head 20 specimens were tested, including canvas, linen, and muslin of different thicknesses. The action of this material, Fig. 4, is much the same as that of paper, Fig. 2. The initial resistance is lower, as it contains more moisture than is the case with paper. For the same reason, when the moisture evaporates off, the increase over the initial resistance is greater than with paper. By reference to the curves of paper and cloth, it will be noticed that their resistance varies in the same manner. For cloth, as for paper, the maximum resistance is at 75 degrees Centigrade. The material does not begin to carbonize until at a temperature of 180 degrees Centigrade, and even beyond that point it loses its mechanical strength very slowly until past 220 degrees.

The explanation for the resistance of cloth, varying, as it does, is exactly similar to that for paper.

OILED PAPER.

In this class 14 tests were made on papers of different thicknesses. With the single exception of one specimen, the resistance of which was very high, the initial resistance was lower than in the case of paper. (Compare Figs. 2 and 5.)

On increasing the temperature the resistance fell rapidly, the curve being much the same as that for japanned paper. The reason for the sudden decrease in resistance is the same as that for japanned paper.

Oiled paper deteriorates mechanically at a lower temperature than paper or cloth, commencing to blacken at so low a temperature as 120 degrees Centigrade.

OILED CLOTH.

In this class 28 specimens of oiled silk, muslin, and linen of various thicknesses were tested. The initial resistance of this material is much lower than that of paper, and on increasing the temperature the resistance falls rapidly, the shape of the curve, Fig. 6, corresponding to those of japanned and oiled paper, the reason for the sudden decrease in resistance undoubtedly being the same as for the japanned and oiled paper. The insulation begins to char at about 120 degrees Centigrade.

GENERAL CONCLUSIONS.

In the foregoing discussion there are some main points to which it is necessary to draw attention. These are:

a. That paper is a better insulation and withstands increase in temperature much better than cloth (shellac and varnish were not used in any of the experiments), oiled paper or oiled cloth.

b. That paper and cloth have a maximum resistance when first heated at about 75 degrees Centigrade, and are not injured mechanically under 180 degrees Centigrade.

c. That the point of maximum resistance for paper and cloth (in this case 75 degrees Centigrade) depends on the rapidity with which the temperature is increased.

Here the authors would like to suggest that if the material were kept at a constant temperature until all the moisture had been evaporated, the resistance of the material would then be its true resistance at that temperature.

d. That all give a high resistance after cooling, but have little mechanical strength.

Oiled paper and oiled cloth, however, after having been heated to 220 degrees Centigrade and allowed to cool, not only have a high resistance, but became so firmly fixed to the brass cylinders that it was found necessary to remove them with a file.

e. That it would be well to bake paper and cloth insulation to 140 degrees Centigrade before applying varnish or shellac.

f. Referring to Fig. 3, it will be seen that on decreasing the temperature the resistance increased, but the second curve does not by any means coincide with the first. On further experimenting in this direction it was found that there is no temperature at which the curve with falling temperature coincides with the first. This may be due to more moisture being driven out at higher temperatures, which is not absorbed by cooling.

Here it may be well to mention an interesting phenomenon that occurred in connection with this investigation.

When the temperature has risen above 100 degrees Centigrade the zinc in the brass cylinder begins to leave its surface and combine with the copper wire wrapped about the insulation, so that the wire has a brass surface and the brass cylinder a copper surface.

Owing to the limited time at the authors' disposal they were unable to further pursue this investigation; but much remains, and any research along this line will be found full of theoretical as well as practical interest.

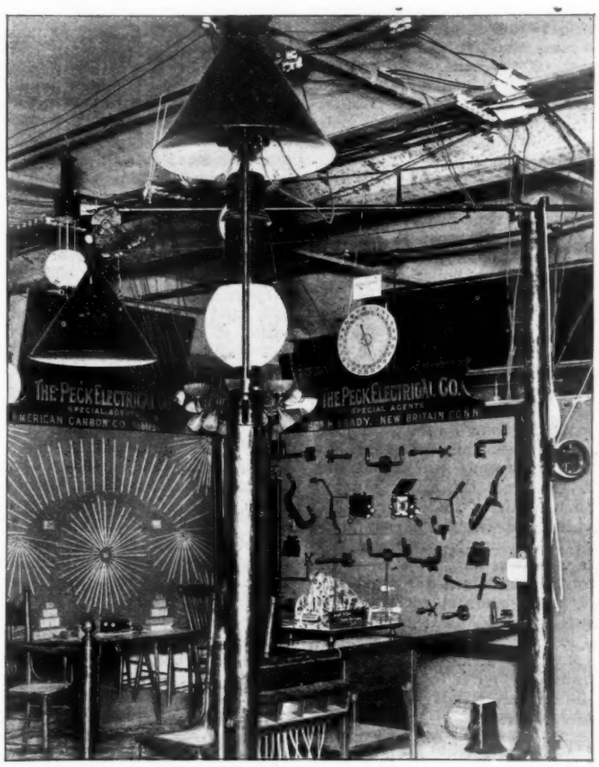


EXHIBIT OF THE PECK ELECTRICAL COMPANY, OF NEW YORK, AT THE NATIONAL ELECTRICAL EXPOSITION, NEW YORK CITY.

Vacuum Tube Lighting and Complexions.

The announcement of the perfecting by Nikola Tesla of his vacuum-tube system of electric lighting, says the New York *Sun*, has been received with so many expressions of satisfaction, and there has been so much said of the benefit to be derived from this great advance in science, that it makes more emphatic and interesting the contrasting objection of a young Long Island woman who was protesting vigorously to some of her friends the other day against any general introduction of the new light for private use. She's a handsome young woman, and she knows it. She knows, also, the desirability and the difficulties of appearing always at the best advantage.

"It's hard enough," she said, "to have to face the glare of so many electric lights of the kind now in use. What can we do when they get this new white light in use? It will be worse than daylight. In our own homes we can use lamps and keep soft shades on them, so that the little wrinkles and the mean places in one's skin are shaded and toned down. But nothing will ever get away from this new light, and you might as well receive a caller out in the yard at midday as in a room lighted in this way. I don't care how practical they are, they shall never come into my house."

Mr. George W. Beers, of Fort Wayne, Ind., who is largely interested in the independent telephone movement in his territory, was a recent New York visitor.

PERSONAL.

Major John E. Hudson, of Boston, president of the American Bell Telephone Company, has recovered from a recent illness and spent several days in New York city last week.

Mr. Frank X. Cicott, manager railway department Pettingell-Andrews Company, of Boston and New York, will sail for Europe on the "New York," to be absent about two months.

Mr. Wm. D. Sargent, vice-president and general manager of the New York & New Jersey Telephone Company, has fully recovered his health after a severe illness and surgical operation. His large circle of friends in and out of electrical circles will be greatly pleased to learn that he is again enjoying good health.

Mr. F. A. Wunder will have charge of the New York office of the Fort Wayne Electric Corporation, 115 Broadway. Mr. Wunder is a gentleman of wide experience in electrical matters, and the Fort Wayne Electric Corporation is to be commended on its selection of a New York representative. President R. T. McDonald, of the company, is in New York a great deal of the time.

The friends of Mr. Thomas A. Edison were all greatly pleased to see him looking so well and so thoroughly vigorous when for a short time he appeared at the Electrical Exposition. Mr. Edison has virtually been in retirement for three or four years past at his mines in New Jersey, perfecting his ore-separating machinery. After investing nearly two million dollars in this work he is now convinced of its success, and in a few months the world will in all probability learn that Edison is again the architect of a large fortune, the result of his own toil and brains and perseverance.

Compressed-Air Motors in New York City.

For several weeks past the sensational daily press of New York city has printed articles to the effect that within a short time the Metropolitan Traction Company will adopt a system of compressed-air motor cars on one of its prominent lines. A representative of the ELECTRICAL REVIEW interviewed Mr. William C. Whitney, and asked him whether this report was true or not. Mr. Whitney replied:

"The report is not true. We are experimenting with a great many things, and, among others, will probably try compressed air."

There are six cars of the Metropolitan Traction Company in the yards of the American Wheelock Engine Company, at Worcester, Mass. It is probable that eventually experiments with the compressed-air motor manufactured by this company will be made on one or more of these cars. As yet no actual trials of the motor have been made. The officers of the motor company have been quoted as saying that they did not know just when experiments would begin.

STEAM BOILERS: THEIR EQUIPMENT AND MANAGEMENT.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, MAY 7, 1896, BY ALBERT A. CARY.

(*Continued from page 273.*)

To show where economy in operation occurs in this system there are many points which may be considered. In the first place, there is a less number of boilers required, which need a smaller boiler house, thus economizing room. Fewer boilers require fewer attendants. There is but 40 per cent of the water needed in this system that is necessary in the second one and that means that it will require but 40 per cent of the fuel when starting the boiler to raise the water from the temperature of the feed to the temperature of the steam, and it must be remembered that the amount of iron-work and masonry to be heated and maintained at a working temperature is far less in this system than in any other. We have now reviewed what might be called one extreme of boiler practice, and have considered the various methods of caring for extreme and sudden demands for steam in large quantities, and, in contrast to this practice, we might now pause a moment to find a boiler working under the other extreme condition—that is, one from which steam is demanded in an almost fixed and unvarying quantity from one year's end to the other. This condition of boiler working is found in some pumping stations where the boilers have practically no other work to do but run the pumping engine, which delivers a fixed quantity of water hour after hour. In such plants as these the requirements are not as severe as in our rolling-mill plant, but the selection of boilers should not be made with any the less care, as, in most cases, such plants supply large communities with water, and a failure in the continuous working of the boilers menaces both health and property; the former depending upon a constant supply of good water for cleanliness, for drinking and cooking, while the latter depends on a large and immediate supply of water to extinguish fires. It is needless for me to argue further here the extreme importance of equipping a city water station with the very best installation that the city can afford, and one which will run for the longest period with the minimum amount of repairs; one which will present the best facilities for periodic inspection and thorough cleaning; one which will give the least trouble and prove the most economical in its consumption of fuel is, without a doubt, the only equipment really to be considered for such very important service. Our mill engine, in most cases, runs for only a portion of the day, while our pumping plant is often operated during the entire 24 hours, month in and month out, thus affording practically no time to take care of any small leaks that may develop, which, if not stopped, are liable to become serious, and the quantity of fuel consumed in continuous and uninterrupted running, amounts to large figures at the end of the year; therefore, it is the poorest sort of economy to install, in such service as this, anything but the most economical working apparatus that can be bought. The first cost of a cheap, uncertain boiler is soon more than outweighed by interruption to constant and continuous service and a low rate of evaporation per pound of coal. I have seen certain boilers that have made an excellent showing immediately following their installation in a plant, but after a period of working, which may be as long as a year or two, their efficiency ceases and then is the beginning of their end. Boilers working under the constant condition just described are also found in ice making-plants, and others are used in connection with blowing engines, and in these plants their continuous operation is imperative—any stoppage being attended with no small loss.

We have now considered what might be called the two extremes of boiler practice and between these extremes most boiler practice lies. Some may think that these two examples cover about all that comes within the consideration of the boiler problem, but I can assure you that the problems involved in the many applications of boilers to the work they have to perform is fully as varied as those met with in the selection of dynamos or motors. Before leaving this subject, I will give one other example, taking, for instance, the boiler equipment of an electric light station, a subject in which we surely are all deeply interested. Here we find again in many plants, as in rolling-mill practice, a frequent variation of load, often changing in a moment from a small to a very large demand for steam. For this service we can not improve much upon our high-pressure boiler already described, with its reducing valves, lowering the high boiler pressure to the lower pressure required for the most economical working of the engine. If we have a single-cylinder engine this lower pressure should be from 80 to 90 pounds, while with a compound engine, expanding its steam through two cylinders, 120 pounds has generally been found good practice. Passing steam through the reducing valve secures a most desirable result aside from the mere reduction in pressure—that is, it either dries or superheats the steam delivered to the engine. A moment's reflection will assure us of this fact. We know that the total heat contained in one pound of saturated steam under 300-pounds pressure is 1,209.3 heat units, and as there is practically no external work done by the steam when passing through the reducing valve, this pound of steam, although reduced to a lower pressure, must contain the same number of heat units. Dry, saturated steam at 90-pounds pressure, we find, contains only 1,182.9 heat units; thus we have (1,209.3—1,182.9) 26.4 heat units in excess of what is needed for dry steam. As dry steam requires but .48 of a heat unit to raise one pound one degree, we find that our reducing valve will raise the temperature of the steam, at 90-pounds pressure, 55 degrees Fahrenheit above its normal temperature, providing the steam entering the reducing valve is dry. Should it, however, contain any moisture, this superheating effort will go towards evaporating the entrained moisture into steam. I have already described the operation of the high-pressure boilers working with their reducing valves, and now you will doubtless say, what saving can there be in fuel with this arrangement? In case our station has been working to its maximum limit and the load is suddenly diminished, the heavy fires carried in order to supply steam enough for our crowded engines will require some little time to burn down to the point needed to supply steam under our reduced conditions. Again, after operating the boilers to supply a light demand for steam and a heavy demand comes suddenly, how can our light fires be brought up quickly to the intensity needed to meet the new requirements? These apparent difficulties can easily be overcome by using a mechanical induced draft with a regulating device which will vary the intensity of the draft to suit the requirements.

As every one knows, combustion, in boiler practice, is controlled by the amount of air passing through the grates. As the supply of air is diminished the fire grows dull, and finally, when it is shut off entirely, the fire smolders and is soon extinguished. The regulated mechanical induced draft is constructed so as to control the air supply of the furnace, and it works between wide limits of variation in a very short interval. This device is simply constructed by placing a fan of the Sturtevant pressure type in the flue between the boilers and the chimney. This fan is driven by means of belting, by a small steam engine working direct upon the driving shaft, or by an electric motor. The speed of each of these driving devices is regulated by means of an attachment, which is moved as the steam pressure varies in the boiler, very similar to the well known action of the automatic damper regulator. This mechanical induced draft is not a patented device, and so is open to all for use. In 1887 I designed and put into service the first mechanical induced-draft system ever used in this country, and, up to two years ago, I believed this plant to be the first one of the kind ever built and operated; but at that time I was brought to realize the truth in the old saying, "There is no new thing under the sun," as I learned that a similar application of a fan for inducing a draft was used in England some 20 or more years ago.*

Unfortunately for the general reputation of this appliance, a number have been installed in various sections of the country which have not been as successful as they might be, but careful investigation has proved to me, in every case that has come under my notice, that the whole trouble has been through inexcusable faults, due in many cases to the sheer ignorance of the ones who designed and erected them.

The mechanical induced draft has been an unqualified success in too many plants to need any championing on my part, and, because a few ill-constructed plants have met with only partial success, there is no reason why the system should not be looked upon with the attention and favor it deserves. In designing this appliance nothing should be done by guesswork or the rule of thumb. It is a comparatively simple matter for a mechanical engineer to calculate very closely the volume of the gases to be handled by the fan after the combustion of a known quantity of any given coal. This being determined, it is then a fairly easy matter to calculate the size of fan required. The fan must be a large one, running with an average load at a comparatively slow speed. A small high-speed fan requires altogether too much power to operate it. The connecting ducts, or flues, must also be of ample proportion that friction may be reduced to a minimum, and all possible turns and bends must be carefully avoided. Very rapid combustion and hurrying of the heated gases through the boiler are generally followed by a discharge of the gases at a very high temperature, and when these are excessively hot, their temperature should be reduced materially before they are allowed to escape into the chimney; this is generally accomplished with a very appreciable amount of saving by using an economizer, which consists of a series of cast-iron pipes placed vertically in the flue, through which the feed water for the boiler is pumped, and, in consequence, heated.

When a regular chimney is used, the maximum intensity of draft is secured when the heated gases escape into the chimney at a temperature of about 600 degrees Fahrenheit, but, when the induced-draft system is in use, the temperature of the escaping gases has no influence on the draft and, consequently, the lower the temperature at which these gases can be discharged the greater will be the economy realized.

Some of you gentlemen may say that this induced-draft system, with its fan and economizer is beginning to run up the expense of equipment and its cost will stand in the way of its introduction into electric light stations, but those who reason this way have doubtless overlooked the fact that the large, costly chimney, necessary in the old plant, is now dispensed with by this new system and, as the fan induces all the draft required for combustion, all we need in the way of a chimney is a short, inexpensive wrought-iron stack of barely sufficient height to discharge the gases at a point where they will not be a nuisance to the neighborhood. W will now find that the money we formerly would spend for one expensive chimney will easily buy us our new apparatus, and it surely will prove, if properly designed and constructed, a far better investment than that massive shaft of brick and mortar. Some may want to stop me here and raise a question over these remarks. They may say an old-fashioned chimney will, when once built, cease to be a source of expense, while the induced-draft system will require steam for the engine to run it as long as it is in service. This is a point well raised, but careful investigation will show that the running expense is more than compensated for by the increased economy of fuel, due to the fact that not one pound more of coal can be burned than is actually required, due to the closely regulated air supply, which can not be approached by the best automatic damper regulating device ever made. Money is saved by the reduction of the discharged flue gases at a temperature lower than possible when the regular chimney is used. The boilers can be made to develop a considerable percentage of power above their rating and they can also be made to work below their rating with greater economy than otherwise possible. When the boiler house is located on treacherous ground, the difficulty and expense of securing proper foundations for the big chimney are left out of consideration. Now, as for the power actually required to operate the engines of a properly constructed plant, investigation will show that it will require, at the outside, not over one per cent of the total power developed.

(*To be continued.*)

* Since reading this paper I have learned that the first induced draft was invented and applied by an American, named Stevens, in 1827.

Manhattan Elevated Losing Time.

[*From the Boston News Bureau.*]

Dr. Duncan, of Johns Hopkins University and president of American Institute of Electrical Engineers, who has been in consultation with officials of elevated roads regarding electricity as a motive power, says: "The Manhattan Elevated system is losing valuable time. It is a mistake to suppose that electric traction is in an experimental stage. Every question connected with the subject has been settled favorably to electricity." He considers it perfectly feasible to run elevated express trains by electric motors from Battery to Harlem in 15 minutes.

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

Electric Light and Power.

DYSART, IOWA—R. H. and B. E. Stickler have been granted a 20-year electric light franchise by the City Council of Grundy Center.

SOUTHBRIDGE, MASS.—The Southbridge Power Company will enlarge its plant. The Electric Road Company will furnish dynamos and motors.

OAKLAND, CAL.—An electric light plant is to be installed in the Masonic Temple on Washington and Twelfth streets.

FRESNO, CAL.—The city hall is to be lighted by electricity.

BERNICIA, CAL.—Solano Electric Light and Gas Company has been incorporated by Thos. McKay, S. Frame, J. Kullman, G. A. Hastings, Geo. Frame. Capital stock, $100,000.

MANOR, TEX.—The Mayor may be addressed for information concerning the installation of an electric light plant.

FORT GAINES, GA.—E. A. Greene may be addressed for information concerning construction of electric light plant of 150 lights.

OSKALOOSA, KAS.—Oskaloosa Electric Light, Power and Heating Company has been incorporated by W. A. McCoy, W. S. Van Cleave, C. E. Chase, M. L. Critchfield, H. H. Huddleston, W. F. Gilluly, N. Damefer and F. H. Roberts. Capital stock, $5,000.

PORTLAND, ME. — The Topeka Water Company has been organized with William C. Eaton, of Portland, president; Harry W. Rerrill, of Portland, treasurer; for the purpose of manufacturing gas and electricity. Capital stock, $1,500,000.

CHATTANOOGA, TENN.—The Dayton Electric Light Company has been formed by Sam Nelson, J. W. Crawford and Thos. Webb, and have leased the Gillespie-Gardenhire electric light plant.

PHILADELPHIA, PA.—Plans are being prepared by Chief Walker, of the Electrical Bureau, for an electric light plant to be erected in Fairmount Park by the Park Commissioners. The power house will be constructed of brick and iron.

ETNA, PA.—A large electric light plant is to be erected at this place by the town. Messrs. Lea & Carroll, 414 Lewis block, Pittsburgh, will superintend the construction of the same.

OVID, N. Y.—Morgan W. La Boyteaux has secured the contract for building the electric light plant at this place.

SOUTH CHARLESTON, OHIO — An electric light plant is to be established here.

FRANKLIN, TENN.—The Harpeth Electric Light and Power Company have sold their plant to Col. John R. McEwen, of this place.

GRUNDY CENTER, IOWA — This place is soon to be lighted by electricity, a 20-year franchise having been granted by the City Council to P. H. and B. E. Strickler, of Dysart.

SAN FRANCISCO, CAL. — Carson Hill Power Company has been incorporated by James H. Cutler, James W. Baker, J. P. Rothwell, J. E. Godley, S. B. McNear, to generate electricity for heat, light and power. Capital stock, $100,000.

COVINGTON, KY.—Rosedale Electric Light Race Track Association has been incorporated with A. R. Mullins, president; J. H. Kruse, secretary and treasurer; L. S. Hatch, general manager. Capital stock, $100,000.

PAWTUCKET, R. I.— City Clerk may give information concerning construction of an electric light plant, for which $100,000 has been voted for that purpose.

SCRANTON, PA.— Mrs. Frances B. Swan, chairman of Home Committee of Poor Board, concerning furnishing and putting in place of an electric lighting plant at Hillside Home.

MILLVILLE, N. J.—N. P. Howell can give information concerning construction of an electric light plant, with a capacity of running 100 arc and 1,000 incandescent lamps.

CHESTER, S. C.—James Hamilton, city engineer, may give information concerning construction of electric lighting system.

RIVERSIDE, CAL.—A. B. Rider, who represents a New York shoe manufacturing company, stated that the company would establish plant at Riverside, if cheap and sufficient electric power could be had.

HAZLETON, PA.—The West End Electric Light and Power Company is inviting proposals for a complete electric light and power plant.

NEW YORK, N. Y.—Consumers' Fuel, Gas, Heat and Power Company has been incorporated by Douglass B. Satterlee, H. C. Copeland, W. R. Smith, M. M. Belding, R. W. Morgan, G. P. Johnson and G. F. Betts, to manufacture and supply non-illuminating gas for fuel. Capital stock, $1,000,000.

DANVERS, MASS.—Julius Peale, registrar, can give information concerning enlargement of electric light plant, for which $11,000 has been appropriated for that purpose.

DALTON, MASS.—It is probable that an electric light plant may be established here.

CHATHAM, N. Y.—The Electric Light Company has purchased a 200-horse-power water-wheel, which will soon be installed at the plant in the Sterne paper mill.

HAGERSTOWN, MD.—Mr. Geo. W. Allison, 23 East Franklin street, informs the ELECTRICAL REVIEW that he is in the market for a complete electric light equipment, including station, steam power, outside and overhead work.

WILLIAMSBRIDGE, N. Y. — The Williamsbridge Electric Light and Gas Company has had plans made for a one-story and basement brick electric light and gas plant, to cost $90,000.

COLUMBUS, OHIO—Bonds will be issued to the amount of $300,000 for the erection of an electric light plant.

FRANKLIN, MASS. — The new Franklin Light and Power Company contemplates adding dynamos to its plant on the island, and will furnish electricity for power, lights and general purposes.

WAUKON, IOWA — The Waukon Electric Light Company has been organized under the laws of Iowa. The incorporators are as follows: Clark W. Thompson, president and treasurer; Charles F. Speed, vice-president and superintendent, and Helmus W. Thompson, secretary. The capital stock of the company is $12,000.

WILLIAMSTON, MICH. — Williamston is to have an electric lighting plant, and the streets of the village will be lighted with 20 arc lights of 2,000 candle-power each. Work will be begun next week.

GILLETT, COLO.—A contract for the electric light plant has been awarded.

ROCHESTER, PA. — The electric light company of this place has decided to double the capacity of its plant, and is now placing 10 additional 100-horse-power boilers. The borough authorities will replace the street incandescent lamps with arc lights.

EDWARDSVILLE, ILL.—The electric light and power company have placed contracts for their new ice machinery and for their cooling tower. They will also add a new 126-horse-power Corliss engine and an additional 1,000-light incandescent dynamo. It is expected that the new day electric current and the ice plant will both be completed and in operation in a few days.

KNOXVILLE, TENN.—The electric light company is taking steps to extend and improve its service.

WORCESTER, MASS.—The Columbia Electric Company last week receiving the contract for installing an isolating electric light plant in the factory of the Greyhound Bicycle Company, at East Brookfield. The same company begins work this week on a 400 electric light plant for a Turner's Falls concern.

PITTSBURGH, PA.—Four dynamos of 2,000 horse-power each are being built by the Westinghouse Electric Company for the Allegheny County Light Company, together with the engines necessary to run them without shutting down the plant for a moment. A new building will also be erected on a larger and better plan than the present on Twelfth and Etna streets.

ETNA, PA. — A $15,000 electric light plant is to be constructed.

JACKSONVILLE, FLA.—R. N. Ellis, engineer, can give information concerning construction of an electric light plant at the waterworks.

NEW YORK, N. Y.—Farquharson Electric Gas Lighting Company has been incorporated by Henry C. Farquharson, D. Frank Root and Roy W. Randel. Capital stock, $100,000.

CAMDEN, N. J.—The Electric Power and Construction Company has been incorporated. Capital, $100,000.

WASHINGTON, D. C.—A party at 3004 M street, N. W., is in the market for a one-half horse-power alternating electric motor.

New Electric Railways.

BRADFORD, MASS. — The Pierce Construction Company, of Massachusetts, has been given the contract for constructing the Bradford Electric Railway and will commence work on Congress street at once.

SCRANTON, PA.—The Scranton & Pittston Traction Company has decided to erect a power house at Avoca to supply power to the new trolley line between this city and Pittston. The power house will be completed within a few months and the line put into operation before the close of the Summer months.

SOUTH BEND, MICH.—An electric railroad will be built soon from this place to Benton Harbor, running through Niles, Buchanan and Berrien Springs. F. E. Lee, the Dowagiac capitalist, is at the head of the movement.

PEEKSKILL, N. Y.—A scheme is now on foot to organize the Peekskill Electric Railroad Company with a capital of $100,000.

HOLMESBURG, PA.—James G. Meeham, of this place, has secured the contract for the erection of the new electric power house at Croydon, to furnish the power for the Torresdale and Bristol trolley.

CHATTANOOGA, TENN.—The Chattanooga & Northside Company will probably extend its electric line to Walden's Ridge. Surveys have been made.

BROOKLYN, N. Y.—The Nassau Electric Railway Company has been granted permission, on behalf of the Atlantic Avenue Railroad Company, to construct a double-track street surface railway on Buffalo avenue.

PETERSBURG, VA.—The Petersburg Electric Railway Company has been reorganized, and the new company will buy new machinery, extend its lines and generally improve the plant.

PORTLAND, ME.—The Portland & Cape Elizabeth Electric Road petition presented to lay a double track on Main street, Knightville.

RICHMOND, VA.—John C. Robertson has applied for right of way to

construct new electric road through Manchester and across the Free Bridge.

AUGUSTA, GA.—The Columbia & Eau Claire Railway Company have asked for charter for new electric road. Capital stock, $50,000.

UNIONTOWN, PA.—The stockholders of the Uniontown Street Railway Company have decided to extend their lines three miles to Brownfield, via Hopwood and Leith.

DUNMORE, PA.—A trolley line will be built between this place and Winton by the Lackawanna Valley Traction Company.

ORANGE, N. J.—The Suburban Traction Company's long and well equipped electric trolley line is up for sale.

WOBURN, MASS.—The North Woburn Street Railroad Company has decided to equip the road with electricity. Ties and rails have already been purchased and the work will be pushed forward rapidly.

WORCESTER, MASS.—It is officially announced that a stock company is being formed to build an electric road from this place to Clinton, and that $85,000 has been subscribed.

JAMESTOWN, N. Y.—Efforts are being made to organize a company to build an electric road from Barcelona, on the shore of Lake Erie, to the Chautauqua assembly grounds.

DANBURY, CT. — The Norwalk Tramway Company has awarded to Rogers, Baldwin & Vickers, of New York, the contract to build the Darien and Westport extensions, and also to double track the road to Roton Point.

BRIDGEWATER, MASS.—The selectmen have granted the franchise to the Brockton, Bridgewater & Taunton Street Railway Company.

New Telephone and Telegraph Companies.

PROVINCE, GA.—The Postal Telegraph Company has established an office at this place with Mr. Herbert W. Bennett as operator.

COBLESKILL, N. Y.—D. C. Dow will erect a telephone exchange connecting the business houses of this village.

MACON, GA.—This place and Americus will soon be connected by telephone.

NATCHEZ, TENN.—Some of the capitalists of this place are considering a plan to connect Fayette, and a large section of the territory in that vicinity, with Natchez by a telephone system.

BELLAIRE, OHIO—The Ohio Valley Telephone Company is extending its lines to Bellaire, Ohio, and will soon be in operation.

WOODSTOCK, VT.—The New England Telegraph and Telephone Company will soon establish a local telephone exchange in this place.

NEW PORTLAND, ME.—The New Portland & Farmington Telephone Company has been organized at this place for the purpose of constructing and operating a telephone line from New Portland to Farmington, with $1,200 capital stock. The officers are: President, John Metcalf, of New Portland; treasurer, W. J. Trefethen, of New Portland.

BRADDOCK, PA.–Allegheny County Telephone Company has been incorporated by H. L. Bishoff, treasurer, Rankin, Pa. Capital stock, $6,000.

CLINTON, IND.—Arrangements are being made to construct a telephone line between this place and St. Bernice.

DES MOINES, IOWA–The announcement is made that about June 1 ground will be broken for the construction of the new plant of the Mutual Telephone Company. It is thought the system can be completed and placed in operation 90 days after the first work is done. The company has secured over 600 subscriptions to its capital stock.

JAMESTOWN, N. Y.—In one month a cheap telephone system is to be established here.

LOWVILLE, N. Y.—The Lowville & Watson Telephone and Telegraph Company's line has been transferred to the Fulton Chain Telephone and Telegraph Company. The purchased line is now in operation from Lowville to Beaver River Station. The company is now constructing a new office at Old Forge. The company contemplates extending its lines throughout the Adirondack region to all the principal Summer hotels and cottages. It will connect with the Central New York system at the Boonville and Lowville

ALBION, N. Y.—An effort is being made at this place to establish the Automatic Telephone Exchange.

OLEAN, N. Y.—A new telephone line is being built between this place and Cattaraugus.

ROCKLAND, MASS.—A movement is to be made among several of the business men of this town to have the telephone service extended from this town to North Hanover and Assinippi, and also to connect with a line to Hingham by the way of Queen Anne's Corner.

GALESVILLE, WIS. — The Luce-Veitch Telephone Company has commenced the construction of a line to Ettrick, a distance of 10 miles. The next extension will be to Melrose and North Bend.

JACKSON, MICH.—A franchise has been granted to the Detroit Telephone Construction Company, by which the latter agrees to establish a metallic telephone line in the city.

MADISON, MISS.—The telephone line that has been under construction between here and Canton for the last month has been finished. This line places this place in speaking distance of Yazoo City, Flora, Carthage and other towns.

LAFAYETTE, IND.—The Lafayette Telephone Toll Company has been incorporated with a capital stock of $10,000.

FENTON, MICH.—A mutual telephone exchange has been organized at Fenton with H. B. Latourette as president, A. H. Douglas, vice-president, and H. J. Phillips, secretary and treasurer. The company starts out with about 50 subscribers.

SYRACUSE, N. Y.—The Automatic Telephone Company has secured over 1,000 subscribers in this place and will soon ask the common council of that city for a franchise.

WARREN, VT.—Five hundred dollars have been raised to run a telephone line from this place to Roxbury.

MARTINSBURG, W. VA.—The system of the Chesapeake & Potomac Telephone Company in western Maryland will shortly be extended to connect this place with Cumberland. The route for the new line runs through Williamsport to Clear Spring and Hancock, to Cumberland.

ROCKVILLE, MD.—The Boyd's Telephone Company has increased its capital stock to $3,000.

New Manufacturing Companies.

JERSEY CITY. N. J.—Mechanical and Electrical Manufacturing Company has been incorporated by Edward Denning, Wm. C. Dillman, Cornelius Olsen, Ely Pullen and Wm. G. Ford, all of Brooklyn. Capital stock, $50,000.

CHICAGO, ILL.—The National Electric Brake Company has been incorporated; capital stock, $100,000; to manufacture brakes. Incorporators, Moses L. Rothschild, George A. Damon and Lorenzo E. Dow.

CAIRO, ILL.—The Delta Electric Company has been succeeded by the Egypt Electric Company.

SAN FRANCISCO, CAL.—The Electric Specialties Company has been incorporated by A. C. Robbins, C. P. Visher, George F. Burtchaell, Daniel Crowley and D. F. Jones. Capital stock, $100,000.

Increase of Capital.

AUBURN, MINN.—The Auburn city railway has increased its capital stock from $250,000 to $300,000.

JOHNSTOWN, N. Y.—The board of directors of the Johnstown Electric Light Company have authorized an increase of $10,000 in the capital stock.

Business Troubles.

OSHKOSH, WIS.—F. H. Joselyn has been appointed receiver of the Central Wisconsin Electric Railway Company.

BAY SHORE, L. I.—Freeman T. Hulst has been appointed receiver of the Bay Shore Electric Light Company.

On Howard's Floor.

The editorial rooms of our esteemed —because instructive and newsy— contemporary, the ELECTRICAL REVIEW, are on the ninth floor of the Times Building, where a super-excellent atmosphere of literary excellence has long obtained.—*Howard's Column, Recorder, New York.*

It is reported that the Union Railroad Company has completed arrangements with the New Haven road for operating the Oakland Beach branch by electricity.

Telephone Entertainments in New England.

The New England Telephone and Telegraph Company have, from time to time, given some very pleasing and instructive telephone entertainments in New England cities. The one given to the members of the Boston Art Club at their elegant rooms on May 22 was decidedly a success and excited much applause and enthusiasm from a large audience of Boston's culture.

The electrical engineer of the company, Mr. I. H. Farnham, conducted the affair and accompanied with an address the several unique experiments illustrating the manifold uses of the telephone.

Forty telephones connected with the speaker's desk were distributed among the audience, by which some of the curious facts were demonstrated. A loud receiver, suspended in the center of the hall, also played its part in the programme. The sensitiveness of the telephone to feeble current, the use of the microphone, the induction balance and telegraphing from a moving train were among the facts described and made clear and pleasing by apparatus.

Following these demonstrations the audience listened to vocal and instrumental music given from Worcester, New York and Chicago, all coming strong and clear. Even Niagara's roar, direct from the "Cave of the Winds," was transmitted to the audience.

Mr. Farnham, in the course of his lecture, referred to the recent remarkable accomplishment of transmitting a telegram 15,000 miles in four minutes. He explained to the audience that this distance and time reduced to Chicago and return would mean about 45 seconds as the time necessary for the voice to be transmitted from Boston to that city and back.

A new experiment was then tried and participated in by the audience, by which the fact was demonstrated that no appreciable time is consumed in passing the effects of the voice over this stretch of 2,500 miles. With the 40 telephones at the ears of the audience, Mr. Farnham's assistant began to count 1, 2, 3; Chicago then took up the count, 4, 5, 6; Boston again, 7, 8, 9, and so on, alternating. The cadence or rhythm was perfect and uniform, impressing and astonishing the listeners. Never had they before so well appreciated the fact that the telephone absolutely obliterates time and space. The test was called for and repeated the second and third time.

OBITUARY.

Henry C. Cranston, president of the Providence Telephone Company, died suddenly at his home in Providence, R. I., on May 27. He was 63 years old and was a member of one of the oldest families in Rhode Island, two of his ancestors having been governors of the State. He was one of the best known business men of the State.

ELECTRICAL PATENTS

ISSUED MAY 19, 1896.

560,421 Electric arc lamp; J. McLaughlin, Chicago, Ill.

560,423 Coin controlled electrical device; J. N. Pierce, Boston, Mass.

560,427 Circuit breaker; W. B. Potter, Schenectady, N. Y.—Consists of a horizontal base plate, a contact plate hinged at its forward end and adapted to yield rearwardly in a vertical plane, the outer face of the contact plate being curved from end to end horizontally, and a spring holding the contact plate in its forward position.

560,428 Electric brake; W. B. Potter, Schenectady, N. Y.

560,451 Electrical block signal and train lighting system; J. C. West, Atlanta, Ga.—Consists of a truck, a sleeve fixed thereto, a bored rod movable in said sleeve, means for moving the rod, a second rod having limited movement in the bore of the bored rod, and a trolley connected to the second rod.

560,452 Electric railway system; G. Westinghouse, Jr., Pittsburgh, Pa.—A circuit-closing switch for electric railways, provided with an armature and contact plates and a loosely mounted support therefor provided with downwardly projecting pins or lugs, and a spring on which said pins or lugs rest.

560,455 Rail bond for electric railways; H. W. Wynan, Worcester, Mass.

560,471 Electric railway switch and box therefor; W. Chapman, Washington, D. C.—Consists of a bottom comprising a pan and trough or channel surrounding the same, a cover or bell having two peripheral flanges at its lower edge, one of which rests in said trough or channel and the other of which extends outside the same.

560,472 Current collecting device for electric railways. 560,473 Electric railway; W. Chapman, Washington, D. C.

560,476 Electric arc lamp; C. L. Coffin, Detroit, Mich.

560,503 Safety device for electric motors; J. D. Ihlder, Yonkers, N. Y.—An electric motor, a duplex shunt circuit of relatively high resistance, including two parts of a magnet coil, and a safety device arranged in said duplex shunt circuit.

560,506 Electric bell; F. Keil, New York, N. Y.

560,513 Electric railway. 560,591 Alternating electric motor; R. Lundell, Brooklyn, N. Y.

560,533 Manufacture of metallic articles by electrolysis; M. Lloyd, Paris, France.

560,551 Electric railway system; D. MacL. Therrell, Charleston, S. C.

560,572 Electrically actuated typewriter; G. H. Davis, Washington, D. C.

560,617 Telephone signal and signaling circuit; A. De Khotinsky, Boston, Mass.

560,618 Electric signaling apparatus and system; M. B. Leonard, Richmond, Va.

ISSUED MAY 26, 1896.

560,652 Electro-magnetic motor; F. M. Schmidt, Brooklyn, N. Y.

560,658 Controller for electric cars; E. A. Sperry, Cleveland, Ohio—A controller cylinder, a switch for reversing the armature connections, a rocking device arranged to actuate said reversing switch, a connecting rod arranged to be actuated by the cylinder, and means for engaging said rod with and disengaging it from the rocking device.

560,667 Incandescent socket; H. C. Wirt, Schenectady, N. Y.

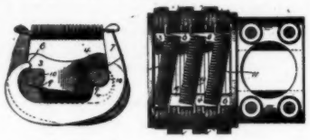
560,671 Electric arc lamp; T. E. Adams, Cleveland, Ohio—Consists of an arc lamp arm and an arc inclosing globe, of a plate made integral with the lamp arm and forming a cover for said arc inclosing globe, said plate, or cover, having a hole for the passage of the upper carbon of the lamp.

560,679 Apparatus for producing musical sounds by electricity; G. Breed, Philadelphia, Pa.—A series of musical strings, a series of electro-magnets arranged in parallel and connected with a source of electrical energy and a system of two-way switches controlling the current to the electro-magnets.

560,703 Electric valve; C. L. Fortier, Chicago, Ill.

560,721 Electric railway; E. H. Johnson, New York, N. Y.—A method of disconnecting a sectional trolley conductor from circuit with a main or lead, when the circuit connections between said conductor and main are due to leaking currents; which consists in conveying the leaking currents around the switching mechanism and thereby causing said switching mechanism to assume its normal or open position.

560,735 Alternating-current generator; W. S. Moody, Lynn, Mass.



560,737.—Commutator Brush.

560,737 Commutator brush; W. H. Morgan, Alliance, Ohio—A commutator brush or shoe composed of a series of independently yielding sections having curved non-coincident contact edges.

560,751 Electric brake; W. B. Potter, Schenectady, N. Y.

560,757 Busy signal for telephone lines; C. E. Scribner, Chicago, Ill.—A switch lever of a telephone set, an indicator adapted to be set by the movement of the lever, a detent controlling the movement of the indicator, and an electro-magnet acting upon the detent.

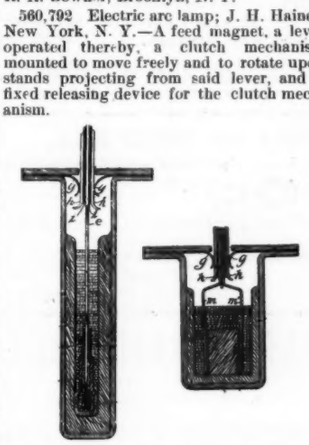
560,761 Telephone circuit. 560,762 Telephone circuit and apparatus; J. S. Stone, Boston, Mass.

560,763 Automatic heat regulating device; J. V. Stout, Easton, Pa.

560,766 Controllable switch-box; J. Van Vleck, New York, N. Y.—An electric mechanism having contacts, an inclosing case for said mechanism having a detachable cover, the said cover having its inner surface inwardly inclined to a downwardly projecting point so disposed that moisture condensing on said surface and dropping from said point will not fall upon said contacts.

560,772 Electrical distribution system; R. R. Bowker, Brooklyn, N. Y.

560,792 Electric arc lamp; J. H. Haines, New York, N. Y.—A feed magnet, a lever operated thereby, a clutch mechanism mounted to move freely and to rotate upon stands projecting from said lever, and a fixed releasing device for the clutch mechanism.



560,807.—Conduit Electric Railway

560,807 Conduit electric railway; W. Lobach, Chicago, Ill.—Consists of a trough extending along the track, a working conductor supported in said trough, fluid insulating material in said trough and surrounding said conductor, and a collecting device extending from the car on said railway and making contact with said conductor.

560,819 Automatic fuse; H. C. Reagan, Philadelphia, Pa.

560,821 Electric cut-out; J. C. Reynolds, New York, N. Y.

560,841 Current collector for electric railways; A. N. Connett, Washington, D. C.—A traveling contact or current collector for electric railways, comprising a hanger, oppositely disposed contact shoes, an interposed toggle, and a spring connection between the toggle and hanger.

565,845 Telephone exchange system; W. W. Dean, St. Louis, Mo.

560,852 Static electrical machine; C. M. Hollopeter, Fostoria, Ohio.

560,861 Multiple telephony; F. A. Pickernell, Newark, N. J.

560,894 Current collector for electric railways; A. N. Connett, Washington, D. C.—Consists of a hanger, yielding shoes, and insulating blocks, pivoted links, bearing-blocks projecting from the hanger, pivot rods, and sleeves loosely encircling said rods.

560,903 Electric railway; W. H. Jordan, Brooklyn, N. Y.

560,917 Elevated electric railway; J. H. McGurty, Jersey City, N. J.

560,921 Thermometric circuit closer or alarm; R. Pearson, London, Eng.

560,988 Electric railway system; N. J. Halpine, United States Navy.—A double electro-magnetic trolley provided with cylindrical magnets and furnished with an electrical contact wheel, a cord or chain connected with the double trolley and with the angle-footed lever pivoted to the platform of the car and connected with the trolley-operating cord or chain.

561,002 System of electrical distribution P. O. Keilholtz, Baltimore, Md.—The method of maintaining constant speed in a motor which consists in reducing its field strength and load in accordance with the current applied to the armature.

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References: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.
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On May 1st the offices of this journal were removed to the well known and modern *Times* Building, at the junction of Park Row and Nassau street, a few numbers above our former address.

This change, after nearly a decade in its present location, the ELECTRICAL REVIEW is compelled to make to allow for a new building to be erected.

All communications to this journal should be addressed, after this date, to the

Electrical Review,
TIMES BUILDING,
P. O. Box 2339, NEW YORK.

April 28, 1896.

KINDRED INTERESTS

The Phospher-Bronze Smelting Company, of Philadelphia, are sending out price list No. 10. This company is the standard in its line of manufacture.

The Scott automatic focusing lamp, manufactured by the Scott Electric Lamp Company, of New York, is a popular lamp with photo-engraving companies. It is said to be the best made, and is used by all the leading companies.

The Bristol Company, of Waterbury, Ct., and 121 Liberty street, New York, have favored the ELECTRICAL REVIEW with their latest publication relating to the Bristol product, such as recording voltmeters, recording wattmeters, recording amperemeters, etc. An interesting fac-simile chart in colors is also included.

The Metropolitan Electric Company, Chicago, are highly elated over the success of their wonderful catalogue. They have bad orders for it from Her Majesty's Government. Turkey in Asia, the gold fields of Johannesburg, Australia, Central and South America, and pretty much around the entire globe, and wherever it goes it brings the highest encomiums for its comprehensive character and attention to details. Those that are interested in electricity in any way should get a copy, as this catalogue is a great help as a "ready reference book" and an "encyclopedia of everything electrical."

The Standard Underground Cable Company announce that they have completed arrangements whereby they are enabled to undertake the installation of underground systems of all descriptions, complete in every detail. They are ready to furnish quotations for the equipment of underground systems with cement-lined pipe, vitrified clay or wooden pump-log conduit, as may seem best under the circumstances, as well as for systems complete in every detail. The company has established a conduit department with Mr. F. S. Viele at its head as manager. Mr. Viele is an experienced practical engineer in conduit and cable construction.

A representative of the ELECTRICAL REVIEW was recently granted an interview by a member of the firm of Aylsworth & Jackson, the manufacturers of the fluoroscope and fluorescent screen, of Orange, N. J., and was informed that in the near future the company expected still further to improve this new instrument, though at the present time it is generally conceded by users that the best of the apparatus which has thus far been made has been the product of this company. In this connection, in refutation of certain statements, Mr. Henry V. Parsell, Jr., writes as follows to Messrs. Aylsworth & Jackson: "I have tried the aluminum fluoroscope and should judge that it is about three-quarters as effective as the Aylsworth & Jackson instruments. There is an irregularity in the luminosity of the screen. To make sure, I have consulted several other experimenters, who agree with me in the foregoing statements."

ALONGSIDE THE MOUNTAIN STREAMS OF NORTH CAROLINA.

Where can a more enjoyable trip be made than to the mountains of Western North Carolina, reached by the Southern Railway, Piedmont Air Line, in a few hours' ride of the Metropolis? The charming resorts of Asheville and others located in these glorious mountains are making their annual preparation for taking care of the large Summer travel that seek a cool and pleasant trip during the hot days of Summer. An attractive book, giving description of Hotel and Boarding House rates, is now being distributed by the Passenger Department of the Southern Railway System upon application to 271 Broadway, New York.

LOW RATES TO PITTSBURG VIA B. & O.

The Saengerbund of North America will meet in Pittsburg, June 8th to 12th.

In pursuance of its usual liberal policy, the B. & O. R. R. will sell round-trip tickets to Pittsburg from all stations on its line, for all trains, June 6th to 8th, valid for return trip until June 13th, at one single fare for the round trip.

Tickets will also be on sale at offices of all connecting lines

For full information address nearest B. & O. agent.

REDUCED RATES TO ST. LOUIS.

The Republican National Convention will meet in St. Louis, June 16. For this occasion the B. & O. R. R. Co. will sell Excursion Tickets from all stations on its line East of the Ohio River for all trains June 12 to 15, inclusive, valid for return passage until June 21, at one fare for the round trip.

The Baltimore & Ohio is a direct line to St. Louis, running two solid vestibuled fast express trains with through Pullman Sleeping Cars attached every day in the year.

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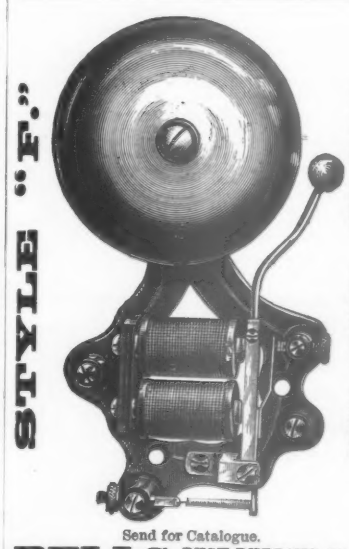

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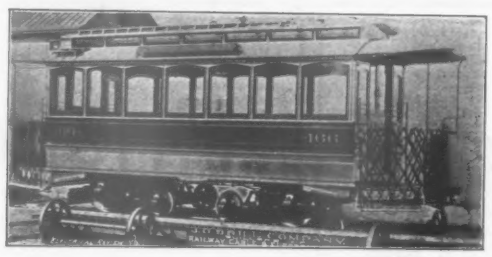

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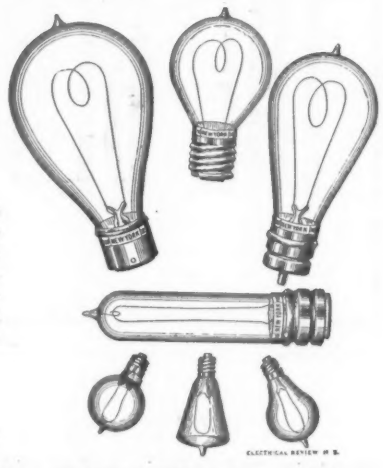

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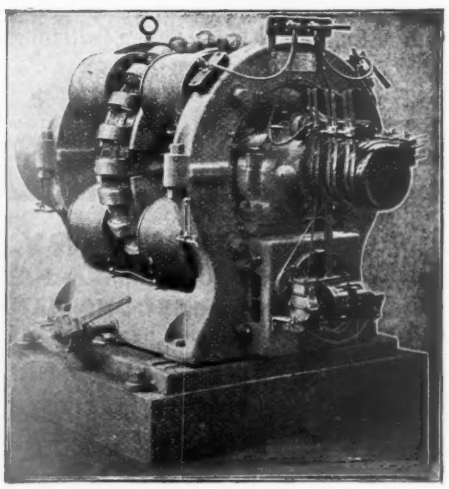

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